

# INFLUENCE OF MOWING ON PHYTOPATHOLOGICAL ASPECTS OF MOUNTAIN MEADOWS DYNAMICS

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## Abstract

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Between 1997–2003 the relation between pratotechnique methods and the development of stand composition was studied in the central Bohemian Forest (Šumavské pláň, Zhůří enclave, elevation 1050–1080 m a.s.l.) and phytopathological aspects of the development process (association *Trifolio-Festucetum rubrae* Oberdorfer 1957) were simultaneously assessed.

The positive influence was proved under the conditions of one-mowing regime, whereas mulching and non-harvest regimes caused, mainly in connection with the attack of *Fusarium* fungi on *Festuca rubra*, its withdrawal from the stands and considerable infestation by weeds (*Hypericum maculatum* and *Holcus mollis*). On the other hand, the attack of *Puccinia perplexans* on *Alopecurus pratensis* was connected with its progressive development, which is related to similar requirements of both the host and the pathogen. This simultaneous development, at the increase in *Alopecurus pratensis* shoots per an area unit and its total coverage, allows for accelerated spread of *Puccinia perplexans* infection, which acquires exponential form when *Alopecurus pratensis* coverage exceeds 1%.

*Key words:* permanent grassland, management, non-harvested stands, *Festuca rubra*, *Holcus mollis*, *Fusarium* spp.

## Introduction

The associations with dominant *Festuca rubra* (association *Trifolio-Festucetum rubrae* Oberdorfer 1957) belong among a significant group of hygrophilous up to mesophilous grass stands that can be included in the association of *Arrhenatherion elatioris* Koch 1926 within Natura 2000 biotope framework.

These stands represent very varied societies in the central area of the Šumava Mts, whose gene pool richness and multifunctional utilisation particularly depends on appropriate pra-

totechnique methods (Klimeš, 2004; Voženílková et al., 2005). The submitted paper focuses on the study of pratotechnique influence on development of stand composition as well as on phytopathological aspects of phytocoenological dynamics.

The implementation of sustainable farming management in mountain and submountain areas requires development of multifunctional utilisation of grass coenoses. Experimental studies of harmonization of production and non-production functions of grasslands came up with the requirements of a synthetic approach to pratoecological, phytocoenological and phytopathological aspects, with simultaneous development of a theoretical basis for optimization of pratotechnique methods (Klimeš, Voženílková, 2001; Klimeš et al., 2004a, b; Voženílková et al., 2005; Klimeš et al., 2006).

The most common and frequent originator of species withdrawal is fungus *Monographella nivalis* (Schafnit) E. Müll. var. *nivalis* 1977, order *Hypocreales* genus *Ascomycetes*, more known as *Fusarium nivale* (Fr.) Sorauer resp. *Gerlachia nivalis* (Ces. Ex Berl. & Voglino) W. Gams et E. Müller (imperfect stage) – snow blight of cereals (Cagaš, 1998). Snijders and Winkelhorst (1996) carried out research of grasslands in western Europe and their experiments demonstrated that it is not snow blight of cereals (*Monographella nivalis*), but other species of *Fusarium* (*F. cerealis* (Cooke) Sacc., *F. graminearum* Schwabe, *F. culmorum* (Wm. G. Sm.) Sacc. and *F. acuminatum* Ellis & Everh.) that cause major damage of swards with dominant components of perennial ryegrass (*Lolium perenne* L.) and red fescue (*Festuca rubra* L.).

Our observations were focused on the study of the pratoecology and pratotechnique effects on expansion and harmfulness of pathogenic fungi, which cause damage and withdrawal of some grass species (*Festuca rubra* L., *Holcus mollis* L.) in grasslands and their phytocoenological dynamics.

## Material and methods

Expansion and harmfulness of pathogenic fungi participating in the withdrawal of dominant grass species (*Festuca rubra*, *Holcus mollis*) was especially observed from the standpoint of synthetic conception of pratoecological, phytocoenological, phytopathological and pratotechnique aspects. The research was carried out in 1997–2004. The trial site (Zhůří, in the Šumava plains) was situated 1050–1080 m a. s. l. The experiments were done in three alternatives (K – mowing, M – mulching, L – non-harvested grassland) in three replications (3x30 m<sup>2</sup>).

Phytopathological analysis of plants attacked by fungi of the *Fusarium* family was carried out in all alternatives and replications in May and June, and a third evaluation was done in July before harvest. The method by Dixon and Doodson (1971) for the evaluation of plant symptoms was used in the experiment. Phytocoenological analyses in the same period were done according to the method by Regál and Veselá (1975). Correlation and regressive analysis was used for the analysis of relationships between phytopathological and phytocoenological characteristics.

## Results and discussion

Permanent meadows and pastures with dominant *Festuca rubra* and *Agrostis capillaris* represent one of most common coenoses in mountain and submontane areas of the Czech Republic. Most of them were established by the process of self-grassing on the arable land (Regál, Veselá, 1957). The presented results are a part of observations carried out in the framework of the geographic network of trial sites oriented according to rising elevation from the southern Bohemian basins up to central part of the Šumava (the Šumava plains).

The observation of the attack of *Fusarium* family fungi on selected grass species at the trial site demonstrated that the attack on red fescue was statistically highly significant ( $p < 0.01$ ) different from creeping velvet grass (*Holcus mollis*) – see Fig. 1. The lowest occurrence of fusarioses was recorded for creeping velvet grass (*Holcus mollis*), and the most serious damage was recorded for red fescue (*Festuca rubra*), especially in non-harvested grasslands (Fig. 1).

In non-harvested grasslands, *Festuca rubra* recorded the biggest withdrawal, from an original 30 to 40% D up to 3 to 6% D. Also in mulched alternatives, red fescue decreased slightly from the grassland by the fungi attack up to about 20 to 30% D. Increased infectious pressure of fusarioses on red fescue (*Festuca rubra*) in mulched, and especially in non-harvested grasslands create worsening conditions for following forage utilisation of these grasslands in the future. The recorded withdrawal of red fescue (*Festuca rubra*) in observed grasslands is even worse due to the fact that red fescue is the only significant present culture grass species in these coenoses. Red fescue in non-harvested grasslands is

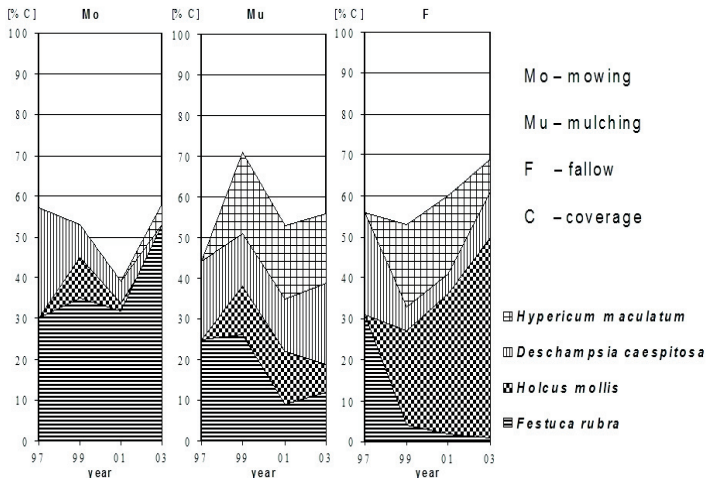


Fig. 1. Phytocoenological dynamics of dominant and subdominant species in different management.

replaced by creeping velvet (*Holcus mollis*) and tufted hairgrass (*Deschampsia caespitosa*), which results in lower quality of forage.

Red fescue (*Festuca rubra*) represents a significant component of mountain grass coenoses and acquisition of theoretical background, for securing their good health is necessary for optimization of pratotechnique methods that allow for multifunctional utilisation of mountain meadows (Klimeš, Voženílková, 2001; Voženílková et al., 2005; Klimeš et al., 2006). In the central part of the Šumava permanent grasslands, with a higher proportion of red fescue, often are included *Trifolium-Festucetum rubrae* among the association, which is one the most varied grass societies with well-balanced relations between production and non-production functions (Klimeš, 2004).

However, versatile utilisation of these coenoses allows their regular mowing, and at meso-oligotrophic stands one harvest per year is sufficient. At meso-trophic stands, it is useful to have two harvests a year.

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