

Title: Patterns of plant species diversity in meadow communities in relation to environmental conditions, management and sampling methods

Author: Grzegorz Swacha

PhD thesis are based on the three scientific articles all published in journal with impact factors (Phytocoenologia, Acta Societatis Botanicorum Poloniae, Plos One) and they passed through rigorous process before acceptance for publication. I have to point out that the scientific journal Plos One is the one of the best journals (Q1) in category “Multidisciplinary Sciences”. In all already published articles the applicant is the first author and at the same time the corresponding author with remarkable contribution to publications. All co-authors of presented papers confirmed that contribution of Grzegorz Swacha was un-substitutable as he conceived the ideas, conducted research as well as write manuscript of all of this papers. Two of papers are focused on theoretical issues (classification of *Molinia* meadow and vegetation sampling methods in *Molinia* meadow) and the last one on practical problems (management) of *Molinia* meadow in relation to vegetation and soil properties.

Structure of the thesis:

In the “Introduction” Grzegorz Swacha shortly introduced topic of the thesis in the Central European context. It was followed by i) Main goals and questions, ii) Materials and methods, and iii) Main results. Further, there were presented three already published papers in original version. Thesis were finalised by “Discussion” and “Summary” based on these three papers.

The aim of the dissertation thesis was based on three main goals:

- i) The first goal - to revise the syntaxonomy of *Molinia* meadows in Poland and to propose a formalised classification of this vegetation at hierarchical levels, i.e. alliance and association.
- ii) The second goal - to examine non-probabilistic (preferential) and probabilistic (random and systematic) sampling methods in the assessment of species composition patterns and environment– vegetation relationships.
- iii) The third goal - to identify factors likely to determine floristic composition in *Molinia* meadows on a small scale and to determine the effect of abandonment on vegetation composition and soil properties.

Based on these three goals he posed six detailed questions, two in each paper:

- 1) Is a formalised hierarchical expert system feasible for the classification of diverse and internally heterogeneous semi-natural vegetation types?
- 2) What are the floristic diversity and environmental patterns of *Molinia* meadows in Poland?
- 3) Does the formal definition of vegetation units match vegetation data collected using different sampling methods?
- 4) Do patterns of plant diversity, species composition and environment–vegetation relationships differ between different sampling methods?
- 5) What is the relative impact of management and soil physicochemical properties on plant species composition patterns?
- 6) What is the effect of abandonment on vegetation composition and soil properties in low-intensity managed grasslands?

Grzegorz Swacha answered on all six questions, which were based on three main goals:

- 1) The formalised hierarchical expert system using Cocktail is feasible for the classification of diverse and internally heterogeneous semi-natural vegetation types of *Molinia* meadow (based on 14549 relevés).
- 2) Based on the formalised hierarchical expert system he presented spatial distribution of associations of *Molinia* meadows in Poland (*Junco-Molinetum*, *Selino-Molinetum*, *Galio-Molinetum*, *Galietum borealis*) and using “Ellenberg’s Indicator Values” he revealed their environmental patterns in Poland.
- 3) Preferential sampling introduces bias towards species-rich stands. However both probabilistic sampling methods (random and systematic) did not differ.
- 4) Plant diversity, species composition and environment–vegetation relationships differed between different sampling methods.
- 5) Soil properties explained four times more variation in species composition than management did.
- 6) Species richness, soil properties (moisture, organic matter, nitrogen, potassium, calcium and magnesium) were higher in mown than abandoned meadow.

According to my opinion and experience PhD thesis has very high standard comparable with the thesis defended at the most prestigious universities in the Czechia and abroad.

Finally I have several questions connected with thesis:

Do you (or some group in Poland) work on the “national list” of Ellenberg’s Indicator Values (EIV) as they can have some regional differences (paper 1)?

In the second paper in the section Materials and Methods is this statement: “Prior to the chemical analysis, soil samples were air-dried” How long and at which temperature are soil samples usually dried? (papers 2 and 3)

Why do you chose the selected methods for plant available nutrients? What are another options and most common methods in Europe? (papers 2 and 3)

As you found there are differences between sampling methods. Do you plant to introduce the record of the type of sampling methods in relevés collected for the Polish Vegetation Database? (paper 2)

What could be another possible explanation for the lowest nutrient contents in the soil under unmanaged *Molinia* meadows? (paper 3)

What is the main problem with management of *Molinia* meadow in Poland? (paper 3)

Final evaluation

Presented thesis is the valuable scientific contribution to problematic of *Molinia* meadows in European context in the tree main fields: i) classification of vegetation, ii) comparison of sampling methods, iii) management effect on vegetation and soil properties. At the end I can state that Grzegorz Swacha demonstrated ability to do research work: i) conceive idea, ii) conduct research and iii) publish paper. Therefore if he meets all other requirements set by the University of Wroclaw I recommend to submit this thesis for defending and after successful defence to award him scientific degree PhD. Because of high standard of thesis I also recommend, if possible, financial award.

Vilém Pavlů (02/21/2019)



Crop Research Institute & Czech University of Life Sciences

Department of Weeds and Vegetation of Agro-ecosystems & Department of Ecology

Rolnicka 6, Liberec