

PhD Thesis Reviewer Report

Title: DYNAMIC OF NUTRIENTS IN GRASSLAND BIOMASS UNDER DIFFERENT MANAGEMENT PRACTICES

Candidate: Klára Pavlů

Supervisor: prof. RNDr. Michal Hejcman, Ph.D. et Ph.D.

Consultant/Advisor: doc. Ing. Petr Homolka, CSc. et Ph.D.

1. Evaluation about main contributions of the Thesis:

The main objectives of the doctoral thesis are focused on the dynamics of nutrients in biomass collected in grassland under different management. This subject is particularly important from the agriculture point of view because grasslands are important ecosystems that have been used for livestock breeding. On the other hand grasslands provide also support biodiversity and many ecosystem services and are vanishing under the human impact and climate change. The PhD student designed the study perfectly to test research hypotheses. Dissertation has provided interesting and new results regarding relationship of management, forage quality and environmental condition. The results of the study have been published in very good IF journals, namely *Plos One* (2019 = IF: 2.74) and *Soil and Environment* (2019=IF: 1.46). The other papers have been shown as manuscript, however, the well prepared paper has no information about target journal. Considering the scientific value of this paper, I am of the opinion that the manuscript will be accepted for publishing in good journal. The set of topics included in PhD thesis are logically connected and focused on forage quality of a semi-natural species-rich grassland under different management, environmental or biological factors. The first paper comprises the research carried out about the impact of different grazing on dry matter standing biomass, concentrations of crude protein, fibres and macro-elements during the grazing season. The most important goal of the paper was identification of the appropriate period to introduce grazing or cutting of forage to meet the best nutrition of livestock. The set of topics included in PhD thesis are logically connected and focused on forage quality of a semi-natural species-rich grassland under different management, environmental or biological factors. The first paper comprises the research carried out about the impact of different grazing on dry matter standing biomass, concentrations of crude protein, fibres and macro-elements during the grazing season. The most important topic in the paper was identification of the appropriate period to introduce grazing or cutting of forage to meet the best nutrition for livestock. In the second paper PhD student try to determine the effects of different intensities of grazing on the nutrient concentrations in the herbage and the soil focusing on

the effect of the presence of dung in the sward under intensive and extensive grazing. Next paper focused on cutting management, herbicide application on herbage productivity, nutrient concentrations in herbage and soil in permanent and reseeded grasslands. The major advantage of this study is that it involves long-term observations in upland grasslands. The last paper concerns the relationship with species richness and soil chemical properties under different management regimes that represent the common and best practices in less favored areas in upland grassland. The authors investigated the effects of long-term restoration managements and previous liming on herbage quality.

2. Scientific quality of the Thesis:

The main goals of the study are well-defined and concern many important agriculture, economical and nature conservation questions. Doctoral candidate skillfully demonstrates a complexity of processes and the interrelationships between management and environmental conditions in various habitat types. The major advantage of this study is that it has included several disciplines of ecology, both basic and applied ecology and agronomy. This interdisciplinary research integrated the knowledge from botany and soil science. The data collection process is methodologically-sound and statistical analyses are relevant to the objectives and research questions. The goals of doctoral candidate's thesis have been achieved by a comprehensive and sophisticated statistical analyses. The knowledge gained from the applicant's investigations are important for understanding grasslands functioning, specifically for understanding complex interactions between forage quality, habitat conditions and management types. In my opinion the obtained results is important and contributed to the knowledge about how management type influence the soil condition and forage quality. The study was conducted on long-term and well-designed experiment established in two randomised blocks in the year 1998. The obtained results are therefore reliable and accurate.

3. Organization of the Thesis:

The structure of the manuscript is clear and well-thought-out. The applied methods are relevant to the study objectives and hypotheses. Figures and tables clearly present the key results. The results of this study are of great practical importance because they show that semi-natural habitats are important forage resource. All papers included in the dissertation are kept in a single train of thought. The manuscript itself is well written and concise. The results are presented in a clear manner and references are appropriately cited in the comprehensive discussion. Most importantly, all the results from this research are essential for scientists working in the field of ecology, agriculture and ecosystem restoration.

I have several questions connected with the thesis.

How have you separated or corrected the effect of species diversity on forage quality?

According to your results, can you suggest changes in traditional harvesting time to obtain the best forage?

Can you describe some methods (excluding use of herbicide) used to restoration of semi-natural grasslands. Can you recommend some to introduce in your experiment?

4. Final recommendation:

I evaluate the thesis as excellent. The author has proven himself to be expert in conducting scientific research and interpreting ecological processes. The thesis is of interdisciplinary character and combines several disciplines of biology and agriculture. I am of the opinion that well-prepared doctoral thesis is the reflection of the good scientific workshop and high qualifications of the doctoral candidate. The Author is a well-experienced young scientist with notable achievements in publishing. The scientific achievements are quite diverse, the majority of them are agriculture-, vegetation conservation-, and biodiversity-related topics. The applicant has also an international experience in cooperation with European vegetation scientists. According to her publications, it seems that Klára Pavlů is not only highly skilled in numerical methods but also in field works. The results of his study are of great importance for the international scientific community and for agriculture and nature conservation practitioners. I have no doubts that Klára Pavlů deserves to be awarded a doctoral degree.

Reviewer: dr hab. prof. Zygmunt Kącki, Department of Vegetation Ecology, Botanical Garden, University of Wrocław, Poland

Signature:

Date: Wrocław, 04.07.2021