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To whom it may concern

Review on the thesis of Michael Hejzman with the title “Effect of fertilizer application on grasslands: What can tell us long-term experiments?”

The thesis deals with the effect of fertilizing on vegetation and population dynamics of selected species as well as on plant species composition and species co-existence. In my opinion, it is a clearly agriculturally focused thesis and rather at the edge of botany. This fact is underlined by the journals in which the candidate published most of the papers of this thesis. However, the knowledge of the nutrient ecology of plant species is necessary to understand their occurrence and is of strong interest for plant ecologists. Therefore, the thesis may be also accepted as a thesis in the field of “Botany”.

On the one hand, the thesis is exceptional in the number of chapters. In total, there are 23 chapters, 19 of them being “original papers”. Most of the papers are already published or in press in (ISI) journals which are under the top journals in the respective field – Chapter 3, 12, 13, 15 and 19 in AGEE (Agriculture, Ecosystems and Environment), chapter 5 and 14 in Nutrient Cycling in Agroecosystems, chapter 7 and 17 in AVS (Applied Vegetation Science), chapter 4 in Folia Geobotanica, chapter 6 in Environmental Monitoring Assessment, chapter 8 in Plant and Soil, chapter 11 in Preslia and chapter 20 in Flora. One fact is astonishing – the candidate has included papers where he is not first author – for a PhD thesis this is normally not common but for a habilitation. This concerns the following chapters: 7 (second from four authors), 9 (third from three authors), 11 (second from six authors), 12 (second from six authors), 14 (second from three authors), 15 (second from five authors) and 18 (third from three authors). However, I have to admit that I am not familiar with the rules of the Charles University in Prague. Despite this fact the number of publications where the candidate is first author is still more than sufficient for a PhD thesis.

On the other hand, one would expect that such a huge number of publications would deal not only with different aspects but different approaches to understand a species occurrence and

dynamics from a “nutrient ecological” point of view. This is not the case. Nearly each paper is just analysing vegetation or plants in relation to soil nutrients or nutrients in the plant itself. Furthermore, any other “limiting” environmental variables such as soil reaction, water availability or light which drive the species composition in grasslands were ignored and therefore, it is often not clear, if the detected pattern depends only on differences in nutrients or probably on other variables. With the exception of chapter 19 (transplantation), no experiments were made to validate that the nutrients are “the limiting factor” for the detected pattern. Less papers but including experiments would have been more useful to push the respective science forward. However, this criticism may be unfair because it is also owing to the amount of papers. Despite this criticism the enthusiasm of the candidate in this topic is “unique” and there is no doubt that the thesis may be accepted. First – all long-term analyses are extremely valuable and contribute to a better understanding of the actual state of art in the composition of a plant community or in understanding a plant species’ occurrence. The papers of the candidate strongly underline the value of long-term experiments. Second – the main scientific results are that **(a)** terrestrial grasslands are not only nitrogen but also phosphorus limited and **(b)** that nitrogen and phosphorus limited plants may occur together. Therefore, depending on the kind of fertilization the plants may react in a different way. There are single publications covering this aspect but this is the first consequent work showing this aspect on a broad range of communities as well as plants. This is exceptional and justifies the fact that different approaches to understand a species occurrence and dynamics from a “nutrient ecological” point of view were not applied. Furthermore, the candidate emphasizes that **(c)** the Ellenberg indicator values for nutrients are not only related to nitrogen but also to phosphorus. **(D)** Last but not least, the candidate is able to show how this knowledge may be applied in the agricultural and nature conservation practice. It is only a pity that he has not proposed an alternative scheme as a consequence of these findings. There are many more detailed findings which could be mentioned but all in all it is despite the criticism easy to recommend the committee to accept the work from Michael Hejman as dissertation. The value of his studies is also shown by the fact that many of them are already published in good journals!

Questions to the defendant:

Which are the limiting nutrients on which soil types and are there any other soil chemical and physical factors which may affect nutrient availability? Under which circumstances potassium may be limiting and why? Are there any plants showing potassium limitation?

What is the “physiology” behind the fact that either ammonium, nitrate, phosphate or potassium may be limiting?

Do plants exist which are phosphorus limited but have no mycorrhiza?

Plants have a strong nutrient cycling activity! Is this a general pattern or do we find it especially under certain circumstances? Are all limiting nutrients cycled? May be also the “cycling activity” a reason why a certain species is more competitive under certain circumstances than another?

Which other environmental factors may limit a species’ occurrence in grasslands?

In which case bryophytes seem to be really promising bio-indicators for certain fertilizers/nutrients. Do bryophytes not rather show the availability of light and water?

Are other functional traits than those related to nutrients limiting a grassland species' occurrence and plant species composition in grasslands?

Further comments

Why nearly no experiments were made to validate the pattern found in the long-term experiment?

What is the scientific perspective after the research done until now?

Regensburg, 13.7.2010

A handwritten signature in black ink, appearing to read 'P. Poschlod', written in a cursive style.

Prof. Dr. Peter Poschlod