Opinion of the reviewer on PhD thesis
by Mr. **Peliyagodage Chathura Dineth Perera**
'Goldenrods invasion in Central Europe – drivers of invasion and environmental effect'

Mr Peliyagodage Chathura Dineth Perera prepared his PhD thesis 'Goldenrods invasion in Central Europe – drivers of invasion and environmental effect' at the Institute of Agroecology and Plant Production of the Wrocław University of Environmental and Life Sciences under the supervision of Dr hab. Dr. Magdalena Szymura and Prof. Dr. Ing. Prof. Vilém Pavlů.

Biological invasions and the environmental changes they cause, damaging the economy and human health, alongside the current climate change, are one of the most important ecological problems. Even though research on biological invasions has received much attention worldwide for several decades, there are still many questions that need to be addressed with scientifically based answers. This makes the chosen research questions of great importance not only from a theoretical point of view but also from a practical perspective.

In the dissertation by Mr. Perera, the research objectives were clearly stated and the hypotheses that guided the design and execution of the research were formulated. The abstract of the dissertation consists of six chapters (Introduction, Purpose and scope of research, Materials and methods, Results, Discussion, Conclusions) and the whole work is based on three articles published in journals listed in the *Journal Citation Reports*. These articles are dedicated to the drivers of invasion and environmental effects of alien *Solidago* species, which are the most widespread invasive plants in Central Europe, originating from North America.

The first article 'Drivers of Solidago species invasion in Central Europe – Case study in the landscape of the Carpathian Mountains and their foreground' (published in the journal *Ecology and Evolution,* 11(18), 12429–12444) examines the effect of propagule pressure, abiotic characteristics of the environment, and biotic characteristics of both the invader and recipient vegetation on the spread of alien *Solidago* species using modelling techniques. The results showed that the spread of *Solidago canadensis* and *Solidago gigantea* is constrained by climatic conditions, as environmental factors in the mountains limit the spread of these invasive species. A particularly important key finding is that human activity can cause variation in the invasion of ecologically similar species.

The second article, 'A community resembling semi-natural meadow is as resistant to goldenrod invasion as highly productive commercial grassland' (published in the journal *Management of Biological Invasions*, 12(4), 873–885), examines the influence of grassland community composition and species diversity on the growth and biomass accumulation of the invasive *Solidago canadensis*, *Solidago gigantea* and the alien *Euthamia graminifolia*. The results showed no significant differences between total biomass production of the examined communities, except for *Euthamia graminifolia*, for which species-rich meadow produced more biomass than the commercial grassland and control. Nevertheless, the results suggest that semi-natural, species-rich meadows are reasonable alternatives to species-poor commercial grasslands to control goldenrod invasion.

The third paper, 'The impact of restoration methods for *Solidago*-invaded land on soil invertebrates ' (published in *Scientific Reports*, 12(1): 16634) examines the effects of *Solidago*

control and eradication methods on the diversity and abundance of soil invertebrates. The results of an experimental study showed that increasing mowing intensity negatively influenced soil organisms, however, mowing twice per year decreased the abundance of soil invertebrates but not their diversity. The results of this study are not only theoretically but also practically important, as they provide a basis for the development of environmentally friendly and effective methods for the control and eradication of invasive species of *Solidago*, as well as methods for habitat restoration.

The three papers that make up the thesis form a unified whole and address the key issues of the invasiveness of species of the genus Solidago, their environmental impact and the influence of control methods on biodiversity. The most relevant literature sources have been reviewed and used professionally in the evaluated publications and in the dissertation abstract submitted for evaluation. There is no doubt that the dissertation submitted for assessment is an original scientific work addressing theoretically and practically relevant issues. The results of the thesis can be widely applied in practice.

All the research carried out in this study was very carefully planned and performed according to a well-developed methodology. The results obtained have been analysed using well-chosen and fully valid methods of statistical analysis.

The conclusions presented in the dissertation abstract are fully supported by the research results obtained, logical and precisely formulated.

Having assessed the submitted material, I can conclude that Mr Peliyagodage Chathura Dineth Perera has an excellent understanding of research methods, is able to organise and carry out research, analyse the obtained results properly, prepare high-quality publications and draw up conclusions.

I have no substantial remarks to make on the content of the thesis and its abstract. There are only a few minor technical or spelling inaccuracies in the dissertation and its abstract, which do not affect the overall quality of the work.

Based on the above, I conclude that the doctoral dissertation meets the requirements specified in Article 187, paragraphs 1-4 of the Act of July 20, 2018, the Law on Higher Education and Science (Journal of Laws of 2018, item 1668, as amended). Therefore, I propose to the Discipline Council of Agriculture and Horticulture at the University of Life Sciences in Wrocław to admit the doctoral candidate to the next stages of the doctoral procedure.

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