



Reviewer comments to the Ph.D. thesis by Peliyagodage Chathura Dineth Perera entitled:

**Goldenrods invasion in Central Europe - drivers of invasion and environmental effect**

Peliyagodage Chathura Dineth Perera obtained the master degree (M.Sc.) in Agricultural Biology, University of Ruhuna, Sri Lanka in 2018. The candidate has previously not applied for a doctoral degree. He was successfully applied for a Ph.D. student position in 2019 to Institute of Agroecology and Plant Production, Wrocław University of Environmental and Life Sciences in the topic of „Goldenrods invasion in Central Europe – drivers of invasion and eradication methods”. He was awarded by several scholarships and mobility awards both at his home university and by the Wrocław University.

The title and topic of the doctoral thesis “Goldenrods invasion in Central Europe - drivers of invasion and environmental effect” covers an important research direction. Goldenrod species from North America successfully invaded many regions of Europe, Asia, Australia and New Zealand. The suppression of the species is difficult, so any information of its invasion biology is very useful for planning eradication and control of established stands. The doctoral thesis contains three sections, each section is dedicated to a particular publication of the candidate. In the three thematically coherent sections the candidate focus on the identification of drivers responsible for goldenrod invasion, analysing the resistance of subjected grassland communities to the goldenrod invasion and evaluates the environmental changes and changes in soil invertebrate communities during application of restoration methods on goldenrod invaded land.

He hypothesised that:

- i) The invasion level of goldenrods at the regional scale can be explained by propagule pressure (P), abiotic factors (A), and biotic interactions (B).
- ii) The vegetation consisting of fast-growing, highly productive grass species, which are typical for intensively maintained grasslands, would be more competitive against invasive goldenrods than a species- and forb-rich vegetation that is characteristic for semi-natural meadows.



iii) The abundance and composition of soil invertebrates collected from stands, where different methods of goldenrod control and grassland restoration were applied, can be used for identification the optimal, environmentally friendly method of land reclamation.

The candidate succeeded to publish the results in three journal papers, in highly respected international journals. In all publications the candidate is the first author. With this publication performance the candidate fulfils the publication criteria obtaining a Ph.D. in most doctoral schools of Europe to my knowledge. The papers were as follows:

**Perera PCD**, Szymura TH, Zając A, Chmolewska D, Szymura M. 2021a. Drivers of *Solidago* species invasion in Central Europe - Case study in the landscape of the Carpathian Mountains and their foreground. *Ecology and Evolution* 11(18), 12429-12444. <https://doi.org/10.1002/ece3.7989>.

**Perera PCD**, Szymura TH, de Patoul L, Sladkovska T, Szymura M. 2021b. A community resembling seminatural meadow is as resistant to goldenrod invasion as highly productive commercial grassland. *Management of Biological Invasions* 12(4), 873–885, <https://doi.org/10.3391/mbi.2021.12.4.07>.

**Perera PCD**, Gruss I, Twardowski J, Chmielowiec C, Szymura M, Szymura TH. 2022. The impact of restoration methods for *Solidago*-invaded land on soil invertebrates. *Scientific reports*.12(1), 1-10. | <https://doi.org/10.1038/s41598-022-20812-5>.

The scientific papers undergone serious and anonymous peer-review process, which secures a high and objective quality control of the research results. The candidate has proven excellent knowledge on the collection, analysis, and synthesis on scientific literature. With the published research in the three papers, he displayed abilities on planning, conducting, and evaluating scientific research. The used data collection methods and analyses are appropriate for the conducted research.

### **New obtained results**

The doctoral thesis is based on the own scientific work of the candidate, he provided essential contribution to each stages of the research, analyses and paper writing; I accept the followings as new and original results of the Ph.D. work:

i) The candidate identified that the distribution of both *Solidago canadensis* and *S. gigantea* over a large spatial extent can be well explained by proxies of propagule pressure, abiotic factors, and biotic interactions.



ii) The candidate validated that the pattern of invasion can be highly variable from region to region, and differences in the type and intensity of human actions can strongly influence the invasion of ecologically similar congeneric invasive species like *S. canadensis* and *S. gigantea*.

iii) It was found that the resident grassland vegetation, under a low-mowing regime, significantly reduced the growth of invasive goldenrods. Semi-natural grasslands, which can be used for high-quality hay production as well as species-rich urban grasslands, are as resistant to invasion as highly productive and intensively managed grasslands.

iv) The candidate validated that in the process of habitat restoration, the intensity of mowing had a significant impact on soil organisms. Mowing once a season and the introduction of a mixture of grasses with legumes constitute the most suitable method for restoring *Solidago*-invaded stands while also maintaining soil invertebrate abundance.

To sum up, I found the thesis of Peliyagodage Chathura Dineth Perera an important research, and I'm convinced that with the obtained and published scientific results he fulfil the perquisites of a doctoral (Ph.D.) degree. I suggest continuing with the process and in case of a successful defence I strongly recommend granting him the Ph.D. degree.

**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 Wroclaw to admit the doctoral candidate to the next stages of the doctoral procedure.**

Debrecen, July 27, 2023.

A handwritten signature in blue ink, appearing to read 'Péter Török'.

Péter Török

Professor of plant ecology  
Department of Ecology