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Opponent's review of the habilitation thesis by **Yulyia Krasilenko Ph.D.**, entitled
"**Novel insights into the biology of stem and root parasitic plants**"
in the study field of Botany
submitted to Palacký University Olomouc

The habilitation thesis by Yulyia Krasilenko Ph.D. consists of three chapters that review the literature on various characteristics of parasitic plants, both stem and root parasites, and both hemiparasitic and holoparasitic plants in the case of stem parasites. The topics addressed cover the complete spectrum from physiology and morphology to ecology and conservation of these species. The candidate's own work, both published and unpublished, as well as the work of her BSc/MSc students, is integrated in this review and is used to illustrate the different aspects of the biology of these plants. This part is 40 pages long, and is followed by a bibliography of 12 pages. The largest part of the thesis, around 350 pages, is taken up by the full texts of 21 publications by the candidate, presented as supplementary material.

The first chapter starts of with discussing the differences between parasitic plants, which comprise around 1% of the angiosperms, and other flowering plants. Although parasitism has evolved independently in several angiosperm lineages, parasitic plants all have an organ, the *haustorium*, that permits them to connect to the vessels of the host plant. Parasitic plants have different levels of dependence on their host: holoparasites have no photosynthesis and depend entirely on their host, while hemiparasites still have chlorophyll and are capable of photosynthesis, albeit less efficient than non-parasitic plants. The chapter further lists the typical traits, such as seed dispersal mechanisms and host-induced germination using phytohormones as cues. The attention here is mostly focused on stem parasites and root holoparasites, and the hemiparasitic root parasites are not really mentioned, although they can have quite different life history strategies, such as an annual life cycle, large seeds which don't disperse very far, low host specificity, and germination occurs without a host present. This is understandable, since the candidate has worked primarily on species that are either stem parasites and root holoparasites, but it would have been better for the sake of completeness to include them here. The second part of the first chapter discusses the role of parasitic plants in ecosystems, in which they will have a direct negative effect on their hosts, but they can also deliver many positive contributions by increasing nutrient cycling, suppressing dominant plant species to make room for less competitive species, providing resources for pollinators and frugivores and nesting opportunities in the case of stem parasites, and can even themselves be parasitised by other parasitic plants.

The first part of Chapter 2 focuses on stem parasites, commonly called mistletoes, which infect the branches of woody hosts. The three known mistletoe species found in Europe are described in detail, and much of the work of the candidate is cited here, ranging from morphology,

biogeography, host species and ecological interactions with pollinators and seed-dispersing birds to development and transcriptomic profiling. The chapter then continues with discussing monitoring and management. In this section, one element that could have been better brought to the front is the economical damage that is caused by mistletoes, and in which domains it is important: is it in agriculture (orchards) or predominantly in forestry that monitoring and management are required?It would also have been useful to add some numbers about the potential damage that can be incurred when mistletoes are not controlled. The part on mistletoes finishes with the description of a drone-based management strategy that has been developed by the candidate, but it is only in the Conclusions that gardens, botanical collections and orchards are mentioned as potential targets of the management methods proposed. Parasitic vines, dodders, are the subject of the second part of this chapter, with detailed descriptions of how the parasite connects to its host, its development, anatomy and gene expression, again with important contributions from the candidate's own work.

The third chapter discusses root holoparasitic plants, which are generally very host-specific, and where knowledge about the triggers for germination has been crucial in developing management strategies of the weedy species, which can cause significant damage to agricultural crops in sub-Saharan Africa and the Mediterranean region. The candidate has performed detailed studies on some of the non-weedy species, such as *Cistanche armena* and *Lathraea squamaria*, and she proposes an interesting study system, the Indian broomrape *Aeginetia indica*, as a new model organism for in vitro studies of host-parasite interactions. The details of this latter interaction have been studied by the candidate and her students and are described in this section. The chapter ends with a discussion of the use of seed micromorphology and fatty acid profiles as a tool for the taxonomy of obligate root parasites in the Orobanchaceae family, which have strongly reduced vegetative parts and highly variable flower morphology.

The quality of the research done by the candidate is already apparent from the number of citations of her own work in the first chapters, but her list of publications is truly impressive. Spanning a period of 11 years, it contains no less than 16 Web of Science-listed publications plus three more in unlisted journals and two under review. Her research covers a wide range of aspects of several species of parasitic plants, ranging from morphology, biogeography and taxonomy to ecology and management. Several of the more recent publications are the result of international collaborations with recognised scientists in the field, which underlines the quality of her work. Five bachelor/master theses are listed among the references, showing her aptitude for supervising students performing research projects.

Overall, the quantity, quality and originality of the research performed by Dr. Yuliya Krasilenko are convincingly, and it clearly fulfils the standard requirements for a habilitation thesis in the field of botany. I therefore strongly recommend this thesis for further advancement in the habilitation procedure.

Quito (Ecuador), 29 November 2025

Renate Wesselingh

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