
TETRADE

Kevin Sartori

<p style="color: rgb(210, 45, 64); font-size: 19px;">Constraints on plant diversity hidden behind genome doubling: Consequences for conservation</p>

<p style="color: dark blue; font-size: 18px;">Faculty of Science</p>

<p style="color: dark blue; font-size: 18px;">ZO ČSOP Bílé Karpaty</p>

How to channel nature conservation efforts given current time and resource limitations? The existence of different levels of diversity (taxonomic, phenotypic, and genetic) and their importance for ecosystems functioning gained recognition, but studies investigating their interaction are still rare in literature. With TETRADE, I propose investigating how a massive but common mutation, whole genome doubling (WGD), affects the most pervasive functional trade-off, the metabolic rate - lifespan spectrum. Genome size doubling allows species to retain allelic diversity: for instance in tetraploids, each individual of a population carries four alleles per locus instead of two. The consequence on plant traits variation and covariation remains to be tested on a large scale and across levels of organization. To address this gap, I will perform two complementary approaches: (i) in-situ, a field sampling to assess the geographic structure of phenotypic diversity among 15 species naturally occurring in contrasted levels of ploidy; (ii) ex-situ, an evolutionary experiment where long established versus neo-synthesized polyploids will be compared to their diploid conspecifics. This will be possible by the taxonomic expertise of both Ivana Jongepierova, chair of the conservation NGO Bílé Karpaty (BK), and Dr. Filip Kolář, expert on polyploids at Charles University (CU). During my time at BK, I plan to use this example of repeated naturally occurring genetic mutation to inform the public about levels of diversity and their interaction. If WGD has predictable phenotypic consequences and consistently alters species distribution, it will inform conservation biologists for decision-making. Back in the lab at CU, I will perform a chemical treatment known to provoke the formation of tetraploids to further study the role of WGD and nuclear/cellular size increase on plant traits coordination. By this mean, I will dissect the roles of allelic diversity and genome doubling on plant strategies.

<p style="color: dark blue; font-size: 18px;font-weight: bold;">Sustainable Development Goals</p>



Meet the Project

If you had to explain your project to someone outside your field, how would you describe it in three sentences?

When we think about the conservation of natural ecosystems, usually the first thing that comes to mind is the preservation of the species richness. By combining experiments in growing chambers and field work in the White Carpathians, a UNESCO-listed plant reserve and biodiversity hotspot, I will dive down into hidden levels of diversity. From the number of genome copies to the diversity of forms and physiologies among individuals within and across species, TETRADE will

explore the consequence of genome doubling on plant diversity at multiple organisation scales to inform conservation strategies and policy makers.

What fascinates you most about the topic of your research project?

If my hypotheses hold true, it would be a rare demonstration on how organisation scales are interconnected. From the doubling of the DNA molecule, we expect cellular processes such as cell division rate to affect organ processes such as photosynthesis, which might affect the life span of the organisms (slow versus fast life), and further the demography of a population and the functioning and evolution of an ecosystem.

How does your research contribute specifically to achieving the UN Sustainable Development Goals?

The White Carpathians are a good example of large natural lands that were misused and ravaged as a consequence of past political decisions and traditional intensive agriculture. I believe we must turn efforts towards the restoration and conservation of biodiversity at all scales to guarantee a safe and enjoyable life for the future generations of humans. The NGO Bílé Karpaty already participated massively in this effort by restoring hundreds of hectares of the most species diverse meadows in Europe. I wish to join my modest expertise in plant genetics and physiology to their effort, as well as strengthen their support from the EU, and strengthen their collaboration with Charles University.

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