Invasion Highways: Microbiomics, Chemotyping and Genotyping of *Ambrosia artemisiifolia* on Selected Polish-Slovak Segments of the E40 and E75

Common ragweed is one of Europe's most invasive and damaging plants, causing significant economic losses and health problems. In regions heavily infested by ragweed, up to 70% of people suffer from allergies when the plant releases billions of pollen grains. Healthcare costs in Europe reach billions of euros, and in Hungary alone, ragweed consumes about 1% of the entire GDP. Farmers across the region report dramatic declines in crop yields, reaching 80%.

Despite ragweed's extraordinary invasion success, we still do not fully understand what makes this plant so remarkably effective at conquering new territories. Major transportation corridors, such as highways E75 and E40, likely serve as invasion routes, connecting Poland with areas already heavily colonised by ragweed.

Our project investigates four key aspects of ragweed's invasion success by analysing 24 populations along highways E40 (east-west gradient) and E75 (south-north gradient). We examine: (1) whether ragweed maintains a consistent team of bacteria and fungi regardless of location, (2) whether it produces the same defensive chemical compounds across all populations, (3) whether highways create distinct invasion routes, and (4) how plant genetic profiles influence the composition of microorganisms and chemical profile.

We use cutting-edge molecular methods, including DNA sequencing of microorganisms, advanced gas chromatography for chemical compound analysis, and modern genetic techniques. This is the first study linking ragweed genetics with its microbiome and chemical profile.

Expected results include identification of key microorganisms accompanying ragweed, characterisation of its "chemical weapons," mapping of genetic invasion routes, and understanding connections between genetic diversity and biological traits. Results will help better understand biological invasion mechanisms, contribute to the development of invasion management strategies, and provide data essential for predicting future ragweed spread in the context of climate change.

The study has fundamental importance for invasion biology and may contribute to the development of more effective methods for controlling this dangerous invasive plant.