

IS HYBRIDIZATION POSSIBLE BETWEEN INVASIVE (*Heracleum sosnowskyi*) AND NATIVE LITHUANIAN (*H. sphondylium*) HOGWEEDS. INSIGHTS FROM AN INSILICO STUDY

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Invasive alien species are a major driver of biodiversity loss, ecosystem disruption, and economic damage worldwide [1]. One particularly harmful invasive plant in Europe is Sosnowsky's hogweed *Heracleum sosnowskyi*, which spreads rapidly, outcompetes native vegetation, and poses serious health risks to humans due to its ability to cause severe skin photosensitivity [2,3]. In contrast, the common hogweed *Heracleum sphondylium* is a widespread native species that plays a long-established role in European ecosystems.

When invasive and native species are closely related, they may interbreed. Such hybridization can create new plant forms with enhanced or reduced adaptability, facilitate the spread of invasive genes into native populations, and ultimately weaken native biodiversity. Furthermore, as *H. sphondylium* is already well established across most of Europe, it can serve as a vector for invasive species to spread into new environments [4]. Previous studies have shown that *H. sphondylium* can hybridize with other invasive hogweed species (*H. mantegazzianum* and *H. persicum*), raising concerns that similar processes may occur with *H. sosnowskyi* [5,6].

In this study, we used publicly available genomic data to investigate *in silico* whether hybridization between *H. sosnowskyi* and *H. sphondylium* is biologically plausible. Analysis revealed substantial genomic divergence and multiple chromosomal rearrangements between the two species, suggesting that hybridization is likely constrained and that resulting hybrids may be rare or sterile.

These findings indicate that, while hybridization between invasive and native hogweeds is theoretically possible, genomic barriers may limit its ecological impact. Understanding such barriers is essential for predicting invasion dynamics and for developing informed strategies to protect native biodiversity.

Acknowledgements

We would like to express our gratitude to Kotryna Kvedaravičiūtė for providing computational resources for this study.

Keywords: Hybridization, Gene flow, Hogweeds, Invasive plants, Invasive species

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- [1] E. S. Osipova, A. Y. Stepanova, D. V. Tereshonok, E. A. Gladkov, and O. N. Vysotskaya, "Genetic Diversity in Invasive Populations of *Lupinus polyphyllus* Lindl. and *Heracleum sosnowskyi* Manden.," *Biology*, vol. 10, no. 11, p. 1094, Oct. 2021, doi: 10.3390/biology10111094.
- [2] L. Baležentienė, A. Stankevičienė, and V. Snieškienė, "*Heracleum sosnowskyi* (Apiaceae) seed productivity and establishment in different habitats of central Lithuania," *Ekologija*, vol. 59, no. 3, Jan. 2014, doi: 10.6001/ekologija.v59i3.2795.
- [3] Z. Gudžinskas and E. Žalneravičius, "Seedling Dynamics and Population Structure of Invasive *Heracleum sosnowskyi* (Apiaceae) in Lithuania," *Annales Botanici Fennici*, vol. 55, no. 4–6, pp. 309–320, Oct. 2018, doi: 10.5735/085.055.0412.
- [4] K. A. Hodgins, P. Battlay, and D. G. Bock, "The genomic secrets of invasive plants," *New Phytologist*, vol. 245, no. 5, pp. 1846–1863, Jan. 2025, doi: 10.1111/nph.20368.
- [5] F. Stewart, "Hybridization between *Heracleum mantegazzianum* Somm. & Lev. and *H. sphondylium* L. (Umbelliferae) in the British Isles," 1979. [Online]. Available: https://era.ed.ac.uk/bitstream/1842/11429/1/Stewart1979_001.pdf
- [6] F. Stewart and J. F. Stewart and J. Grace, "An experimental study of hybridization between *Heracleum mantegazzianum* Somm. & Levier and *H. sphondylium* L. subsp. *sphondylium* (Umbelliferae)," *Watsonia*, vol. 15, pp. 73–83, Jan. 1984, [Online]. Available: <http://archive.bsbi.org.uk/Wats15p73.pdf>, "An experimental study of hybridization between *Heracleum mantegazzianum* Somm. & Levier and *H. sphondylium* L. subsp. *sphondylium* (Umbelliferae)," *Watsonia*, vol. 15, pp. 73–83, Jan. 1984, [Online]. Available: <http://archive.bsbi.org.uk/Wats15p73.pdf>