Invasive plants are a threat to native species due to their high competitiveness, ability to germinate under a wide range of conditions, and their capacity to form soil seed banks. *Heracleum sosnowskyi* is a dangerous biennial or perennial plant that causes environmental damage and negatively impacts human health and the economy. The aim of the doctoral thesis is to understand the seasonal pattern of dormancy and germination of *Heracleum sosnowskyi* diaspores and to determine the effect of their persistence in the soil seed bank on the composition and content of soluble carbohydrates.

The dissertation consists of two parts. The first part is theoretical, discussing the dormancy and germination of diaspores, factors regulating these processes, and providing information on soluble carbohydrates. The second part is experimental, detailing the results of research on the ecophysiology of Sosnowski's hogweed diaspores.

The results showed that Sosnowski's hogweed diaspores (*H. sosnowskyi*) form a persistent soil seed bank. During their time in the natural soil seed bank, the diaspores remain in a state of dormancy, characterized by seasonal variability. Dormancy is relieved in winter during natural stratification. Gradually increasing soil temperatures in the spring positively influence the breaking of dormancy in the diaspores. Sosnowski's hogweed diaspores exhibit low resistance to reduced water potential, which may be related to their limited tolerance to stress caused by reduced water availability and restricted germination capacity under water stress conditions. Diaspores of *H. sosnowskyi*, whether in the soil or under laboratory conditions, maintained their viability at a very high level for at least 28 months. Stratification of Sosnowski's hogweed diaspores in natural and laboratory conditions caused the termination of primary dormancy. Fluridone and gibberellins influenced the induction of germination of *H. sosnowskyi* diaspores and were synthesized *de novo* during the experiments. Paclobutrazol and abscisic acid inhibited the germination of *H. sosnowskyi* diaspores.

Soluble carbohydrates constitute a small percentage of the mass of *H. sosnowskyi* diaspores - their content does not exceed 4.8% of the diaspores mass. The content of soluble carbohydrates in *H. sosnowskyi* diaspores decreased with the length of time they remained in the soil seed bank. Characteristic soluble carbohydrates in *H. sosnowskyi* diaspores, similar to other species in the *Apiaceae* family, include sucrose, glucose, fructose, and arabitol. In *H. sosnowskyi*, arabitol was present exclusively in freshly collected dormant diaspores and was not found in diaspores in the soil seed bank. Changes in temperature and soil moisture during the time diaspores remain in the soil lead to changes in the content of soluble

carbohydrates and the quantitative ratios between different soluble carbohydrates in *H. sosnowskyi* diaspores. Throughout the period of dormancy in the soil seed bank, sucrose and an unknown trisaccharide are the dominant soluble sugars in these diaspores.

A high negative correlation was found between the content of fructose, glucose, arabitol, the unknown trisaccharide, and the percentage of germinating *H. sosnowskyi* diaspores, as well as between the content of maltose and the percentage of germination of Sosnowski's hogweed diaspores. A positive correlation exists between the content of sucrose, myo-inositol, and other unknown soluble carbohydrates and the percentage of germination of Sosnowski's hogweed diaspores. There was also a positive correlation between the mean germination time and the content of fructose, glucose, arabitol, myo-inositol, and the unknown trisaccharide, as well as a negative correlation for the content of sucrose and maltose. There is a positive relationship between the average monthly temperature and the content of fructose, glucose, maltose, arabitol, and the unknown trisaccharide, and a negative correlation between precipitation and the content of sucrose and *myo*-inositol.

The conducted research allows for an understanding of the ecophysiology of Sosnowski's hogweed diaspores and may contribute to the expansion of knowledge on biological methods for the eradication of invasive species.