UNDERSTANDING THE FUNCTION OF MACROPHYTES IN NITROGEN AND PHOSPHOROUS MANAGEMENT IN SMALL WATER BODIES

Malgorzata Suska-Malawska[1], Monika Czarnecka[1], Monika Mętrak[1], Marcin Sulwinski[1], Piotr Pokarowski[2]

[1]Biological and Chemical Research Centre, Faculty of Biology, University of Warsaw, Żwirki i Wigury 101, 02-089, Warsaw, Poland

[2] Faculty of Mathematics, University of Warsaw, Banacha 2, 02-097, Warsaw, Poland

Contact: Malgorzata Suska-Malawska, m.suska-malaws@uw.edu.pl

Small water bodies like ponds and wetlands can absorb and retain nutrients efficiently. This can largely be attributed to macrophytes - aquatic plants that play a vital role in maintaining the ecological balance of these ecosystems.

Our study aimed to investigate the critical environmental factors influencing nitrogen (N), phosphorous (P), and nitrogen stable isotope (d15N) uptake by *Phragmites communis* (reed) and *Typha latifolia* (cattail) growing in midfield ponds in the Mazurian Lakeland, NE Poland. Both plants are generalist species, used in sewage treatment and co-occurring in areas with similar chemical properties. To investigate the nutrient management of each species, we collected 37 leaf biomass samples of reed, 47 samples of cattail, and 110 samples of sediments from 15 small ponds in different surroundings (cultivated fields, fallows, meadows, forest).

Detailed statistical analyses showed significant differences in leaf N, P, and carbon isotopic ratios between reed and cattail, while no differences were recorded for their nitrogen isotopic ratios. Under similar conditions, reed leaves accumulate more N and heavy carbon isotopes than cattail, while the latter accumulates more P. These differences seemed to be driven exclusively by species-specific strategies for nutrient accumulation, as no correlations were found with environmental factors studied. The mathematical model describing the N:P ratio in reed and cattail showed that Ca content in plant biomass is an important feature influencing this ratio (r=-0.7). This effect was more pronounced in cattail than in reed. The second model explained the N isotopic ratio in leaf biomass and, thus, gave some insights into plant d15N uptake. According to the results, sediment pH positively influenced leaf dN_p in both species (r=0.55), while the sediment C:N ratio had a negative influence (r=-0.55). Sediment chemistry, including C:N ratio, was shaped by the characteristics of the pond surroundings (r=0.4). Additionally, leaf dN_p was determined by interactions between N and C isotopic ratios of the sediments and some water features (e.g. pH and phosphorus content).

The results of our research indicate an evident disproportion in the accumulation of nitrogen and phosphorus between both studied macrophytes. However, it must be acknowledged that the extent of this accumulation depends on various biogeochemical interactions in the sediments and the exchange of nutrients between water and sediments. Moreover, these processes are significantly influenced by the surroundings of small water reservoirs.