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Plasticity and Adaptation of Fatty Acid Profiles in Four Lemnaceae Species under Varying Thermal and Nutrient Regimes

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The Lemnaceae family exhibits remarkable ecological plasticity, allowing these aquatic plants to thrive in diverse freshwater habitats. A key mechanism of this adaptation is the modulation of membrane lipids, which is crucial for maintaining biological functions under fluctuating environmental conditions. While their potential as a sustainable protein source is well-known, the ecological drivers shaping interspecific variations in fatty acid profiles remain under-explored. This study examines the physiological adaptations of four species (*Lemna gibba, L. minor, L. turionifera,* and *Spirodela polyrhiza*) from Mecklenburg-Western Pomerania, Germany. Through a common garden experiment, we analyzed the influence of temperature (18, 24, 30 ℃) and nutrient availability (half, standard, and double concentrated N-medium) on fatty acid profiles. Results show generally comparable profiles across species, regardless of turion-forming abilities. However, *L. gibba* exhibited higher proportions of stearidonic and ɣ-linolenic acids, whereas S. polyrhiza showed only traces of these compounds. Temperature exerted a stronger influence than nutrients; higher temperatures increased saturated fatty acids while reducing polyunsaturated fatty acids, particularly n-3 types. Minor nutrient effects were observed in *L. gibba* and *S. polyrhiza.* These findings highlight thermal adaptation as a primary driver of lipid metabolism. Further research on nitrogen-phosphorus ratios and clones from warmer regions may further unveil specialized desaturase adaptations to higher temperatures.

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Bernhardt PDH (2024) Fatty acid profiles of regional Duckweed species. Master Thesis - University Greifswald, Faculty of Mathematics and Natural Sciences, Institute of Botany and Landscape Ecology

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