Duckweed Outbreaks Could Be a Good Thing

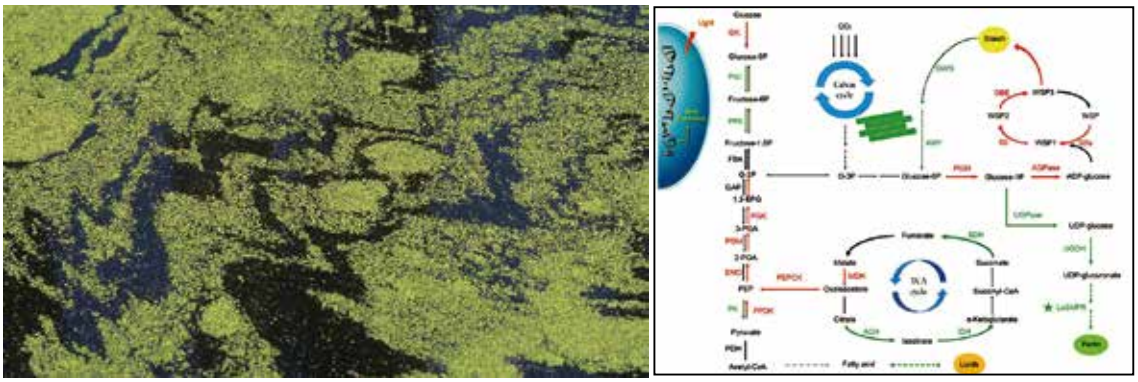
Rising temperatures and rain have led to multiple occurrences of duckweed outbreaks in recent years, when duckweed is considered as a promising source of energy thanks to its high starch content and rapid growth rate. Starch accumulation in duckweed involves complex processes that depend on the balanced expression of genes controlled by various environmental and endogenous factors.

A research team from the Qingdao Institute of Bioenergy and Bioprocess Technology (QIBEBT), Chinese Academy of Sciences has found the key gene for the efficient starch accumulation in duckweed using transcriptome, metabolics and related enzyme activity determination method.

The researchers analyzed the transcriptomic profiles and metabolite patterns of duckweed (*Lemna aequinoctialis* 6000) during a seven-day course under nitrogen starvation. Differentially expressed genes (DEGs) were identified and categorized as various functional classifications and nitrogen starvation-related metabolic metabolisms, which were further validated by examining specific enzyme activities. The results demonstrated the feasibility of using transcriptome data with a next-generation sequencing (NGS) method to identify interesting pathways and potential target genes, which could serve as excellent candidates for functional genomics studies and metabolic engineering to improve the production of next-generation biofuels in duckweed.

Starch metabolism is a complex process triggered by changes in the levels of numerous transcripts and metabolites. Their results presented the dynamic transcriptome changes in *Lemna aequinoctialis* 6000 and revealed the complex mechanisms in starch accumulation. The genes identified as involved in starch metabolism represented excellent candidates for further genetic improvement of starch production in duckweed.

Their findings have been published in *Biotechnology for Biofuels*. The study was supported by the National Key Technology Research and Development Program of China, the National Natural Science Foundation of China, Shandong provincial government and the Taishan Scholar Program of Shandong.



(**Left**) Duckweed floating on the surface of water; (**right**) a hypothetical model of pathways related to carbohydrate metabolism during nitrogen starvation in *L. aequinoctialis*.