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The uses of duckweed in relation to water remediation

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ABSTRACT

Duckweeds are small, simply structured floating plants that grow on surface waters. They grow rapidly and are easy to cultivate, harvest, process and analyze, which makes them useful in many ways. Duckweeds are of great value in illustrating the physiological effects of toxic water contaminants on plants and serving to indicate the presence and environmental risk of such toxins. The pronounced capacity of duckweeds to assimilate aqueous nutrients and to take up and mediate the removal of a variety of toxic substances from aqueous solution constitutes the potential of these organisms for wastewater remediation. The biomass yielded by duckweed growth – particularly on nutrient-rich wastewater – has a high nutritional value and is well suited for biofuel production, as well as being useful for fertilization, biosorption and soil and water amendment. Duckweeds thus have the potential for integrating a significant contribution to meeting food, feed and energy demands traditionally supplied by terrestrial crop plants and fossil fuels with the remediation of polluted waters. Duckweed growth can also be used to directly generate bioelectricity, and the success of genetically transforming duckweed plants opens the road to biomanufacturing with these organisms, both of which are in principle compatible with wastewater remediation. However, neither wastewater remediation by duckweeds nor the exploitation of the multiple potential benefits of wastewater-grown duckweed biomass has yet been widely implemented. The present review underlines the potential of duckweeds for combining resource management with water remediation, while examining the difficulties encountered in the realization of this potential.

Keywords: Duckweeds; Uses; Water remediation; Biomass production; Biomass utilization

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