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Fog-o-ponics; a novel duckweed cultivation method

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Innovative cultivation techniques are required for new circular economy applications that require cultivation of large surface areas of duckweed under indoor conditions. To increase duckweed cultivation area relative to floor space, multilayered cultivation systems have been developed. In these stacked systems, duckweed is cultivated on liquid medium, an approach inspired by the natural, floating habit of these aquatic plants. LEDs are sandwiched between each cultivation layer to provide homogenous light conditions. Stacked systems can successfully generate large amounts of duckweed biomass, but their construction involves an engineering challenge due to the sheer weight of the water column and associated mechanical support structures. As a result, most stacked systems comprise less than 10 cultivation layers. As an alternative, growth of duckweed in a mist of nutrient-supplemented fine droplets, i.e. fog-o-ponics, was pioneered. The advantage of fog-o-ponic cultivation of duckweed is that trays with water are omitted and replaced by a thin layer of fabric on which the duckweed is positioned. Fog droplets pass through the hydrophobic fabric, to be returned to the mister, creating a circular flow-thru system. The use of fabrics substantially decreases the weight and thickness of each layer of duckweed in a stacked fog-o-ponic cultivation system, and as a consequence enables increases in the number of duckweed layers per unit of floor space. Lemna minor was grown in a fog-o-ponic system comprised of 10 cultivation layers in an incubator of just 40 cm height, demonstrating good growth and an attractive metabolic profile, as well as upscaling potential.

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References

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