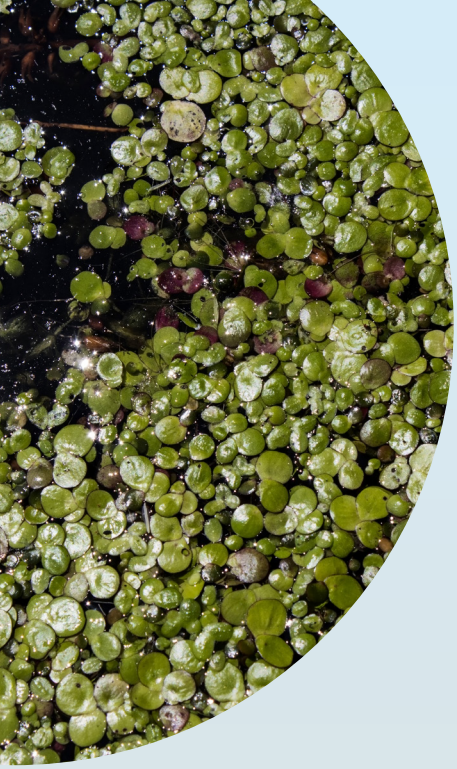


Fog-o-ponic, an innovative multi-layer duckweed (*Lemna minor L.*) system to remove nitrogen and phosphorus from wastewater

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Background/Problem

Excess nitrogen (N) and phosphorus (P) in wastewater contribute to eutrophication and are costly to remove with conventional treatment. Duckweed can capture nutrients, but classical multi-tier systems are limited by the weight and depth of stacked water columns.

Practice Change

Implement a lightweight, fog-o-ponic duckweed bioreactor that grows Lemna minor on fabric supports while delivering nutrient-rich water as a fine fog in the absence of a heavy column of water. This enables a bioreactor with a very large number of stacked growth layers, massively increasing growth per square meter of floor space.

Evidence

In controlled trials, *L. minor* grown *"fog-o-ponic-ally"* achieved strong growth, comparable to traditional liquid culture. This was paralleled by extensive removal of nutrients from wastewater, and uptake into the plant

Setting/Participants

Indoor pilot installation at a facility or lab-scale treatment area handling nutrient-rich influent (e.g., wastewater or hydroponic/ agricultural runoff).

Implementation Plan

Build a rack with multiple stacked trays lined with wicking fabric; seed each layer with L. minor. Deliver influent via fog/misting at set intervals; control light and humidity; collect effluent for testing. Harvest duckweed weekly to maintain rapid growth and nutrient capture.

Outcomes/Measures

Track influent/effluent TN and TP, calculate removal per area (mg m^{-2} day^{-1}), monitor duckweed health (Fv/Fm), biomass yield, and system uptime.

Conclusion

Fog-o-ponic duckweed cultivation is a space-efficient, scalable option for indoor phytoremediation with measurable N and P removal and strong plant performance.

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Relative
Growth Rate
up to **0.24d^{-1}**

Healthy Photosynthetic
Performance
(Fv/Fm ~ 0.8, Y(II) ~ 0.5)

Total nitrogen removal
~500 mg m^{-2} day^{-1} (wwt)

Plant uptake rates of
~285 mg m^{-2} day^{-1} (TN) and ~70 mg m^{-2} day^{-1} (TP)
over 7 days/ *in controlled environment