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## Eutrophication State Monitoring for Unhealthy Aquatic Ecosystem Via Free-Floating Macrophytes Pattern

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### Abstract

Nutrient enrichment or eutrophication is a process of increasing plant nutrients in water bodies, frequently due to run-off from the land, which causes a dense growth of plant life. Eutrophication process is assisted by internal and external sources of nutrients such as nitrogen fixation and phosphate. In freshwater ecosystem, anthropogenic source of nutrients such as detergents, fertilizers and organic debris are among the sources of excess nutrients for nitrogen and phosphorus. It also has been proved to be a major factor which contributes to eutrophication and consequent algal blooms, spreading of certain aquatic macrophytes, depletion of oxygen and loss of key species leading to degradation of many freshwater ecosystems. This study aimed to discover the abilities of free-floating aquatic macrophyte species as a phytoindicator for eutrophication either at contamination or pollution level in polluted aquatic ecosystem to support their upcoming development and prospective through landscape ecology approach. The effects of nutrients (ammonium, phosphate, nitrate and nitrite), the free-floating aquatic macrophytes and locations have been studied on eutrophication in aquatic freshwater ecosystem. All species ( *Eichhornia crassipes*, *Lemna minor*, *Neptunia oleracea*, *Spirodella polyrhiza*, *Salvinia molesta* and *Pistia stratiotes*) were detected with high level of phosphate at level III at all localities (Pahang, Selangor and Kelantan). Ammonium concentration was varied from class I to class III. In conclusion, changing in *E.crassipes*, *L.minor* and *S.polyrhiza* pattern and behavioral are proven to be the best phytoindicator for eutrophication state monitoring.

**Keywords:** Eutrophication, Phytoindicator, Free-floating macrophytes, Aquatic ecosystem



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