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The Effect of Fermentation Time on the Nitrogen and Phosphorus Content Increase of the Water Hyacinth (*Eichhornia crassipes*)

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Authors

- [Muhamad Ikbali](#) ¹ [Muh. Yusri Karim](#) ² [Gunarto Latama](#) ³ [Rustam Rustam](#) ² [Nurfadilah Nurfadilah](#) ⁴ [Andy Rasyadi](#) ⁵

¹ Post Graduate Student of Agricultural Science Program, Graduate School, Hasanuddin University, Makassar, Indonesia

² Faculty of Marine Sciences and Fisheries, Hasanuddin University, Makassar, Indonesia

³ Departement of Fisheries, Faculty of Marine Science and Fisheries, Hasanuddin University, Indonesia

⁴ Faculty of Fisheries, Cokroaminoto Univeristy, Makassar, Indonesia

⁵ Department of Aquatic Resources Management, Faculty of Marine Sciences and Fisheries, Udayana University, Bali, Indonesia

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Abstract

The availability of essential nutrients, particularly nitrogen (N) and phosphorus (P), significantly affects soil fertility and the health of aquatic ecosystems. The excessive use of chemical fertilizers has resulted in various environmental issues, such as eutrophication and groundwater pollution. As an environmentally friendly alternative and to mitigate weed problems, water hyacinth (*Eichhornia crassipes*) biomass holds great potential for utilization through a controlled fermentation process. This study aims to examine the effect of fermentation duration on the increase in N and P content in the fermented water hyacinth solid product. The research utilized 12 glass jars, each with a volume of 3 liters, employing a completely randomized design (CRD). Four fermentation duration treatments were tested for 7, 12, 17, and 22 days, each with three replications. The N and P contents were analyzed using the Kjeldahl method and Spectrophotometry (Olsen method), respectively. Analysis of variance (ANOVA) showed that the fermentation duration had a highly significant effect ($P < 0.05$) on the N and P content of water hyacinth. The DMRT post-hoc test confirmed that fermentation for 22 days yielded the highest content for both nitrogen (0.6909%) and phosphorus (0.4063%). These findings practically recommend the 22-day duration as the optimal period for converting water hyacinth biomass into high-quality organic fertilizer, thereby supporting sustainable aquaculture and agricultural practices.