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Assessing the Growth Performance of *Chlorella vulgaris* Using Low Cost Growth Media as a Bioenergy Source

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Abstract

Industrialization has significantly increased the dependence of fossil fuel, which are often regarded as unsustainable due to several challenges: dwindling oil supplies, rising cost and their substantial contribution to environmental degradation through the emission of greenhouse gases. These environmental impacts are critical drivers of climate change, making a transition from non-renewable to renewable energy sources essential for a more sustainable future. Among the promising solutions, bioenergy has gained attention as a key alternative fossil fuel offering potential and environmental and economic benefits. Among various bioenergy sources, microalgae have emerged as one of the most promising feedstocks for biofuel production. Microalgae, *Chlorella vulgaris*, are fast growing, eukaryotic organisms capable of performing photosynthesis highly efficiently. As cost-effective culturing of microalgae is crucial for the successful production of biofuels, different alternatives need to be investigated. The objective was to comparatively evaluate the growth performance of microalgae species C. vulgaris using recommended betel fertilizer (N-10%: P_2O_5-10%: K_2O-8%) medium with Guillard and Ryther's modified F/2 media. The experiment was designed using a Randomized Complete Block Design with four replicates for 10 days duration and concentrations of betel fertilizer varied based on N content. These concentrations were similar to F/2 medium, half concentration and double concentration. The 500 ml conical flask was used for cultivation of microalgae with aeration under laboratory conditions. The beetle fertilizer mixture with N content similar to that of the F/2 medium resulted in a significantly higher dry weight content of C. Vulgaris compared to other treatments. It was noted that there was a 32% increase in dry weight compared to the F/2 medium. By utilizing this alternative culture media, significant cost-effectiveness was achieved compared to the F/2 medium. The production cost of algal biomass using betel fertilizer was observed to be as low as SLR 220 per kg of dry weight. This underscores the economic advantages of employing more affordable nutrient sources for large-scale microalgae cultivation.

Keywords: *Micro algae, Bioenergy, Growth media*