

RINGKASAN

Kelapa sawit (*Elaeis guineensis* Jacq.) merupakan komoditas perkebunan utama yang memiliki nilai ekonomi strategis bagi Indonesia. Peningkatan kualitas bibit kelapa sawit di tahap pre-nursery dapat dilakukan melalui optimalisasi pemupukan organik dan anorganik pada media tanam *Ultisol*. Pupuk Organik Cair (POC) eceng gondok (*Eichornia crassipes*) Plus mikro Cu, Zn, dan B berpotensi sebagai agroteknologi alternatif yang ramah lingkungan untuk mendukung pertumbuhan optimal bibit kelapa sawit. Eceng gondok merupakan gulma air yang dapat diolah menjadi pupuk organik cair yang mengandung unsur hara makro dan mikro, sementara kombinasinya dengan pupuk NPK diharapkan dapat menggantikan atau mengurangi serta memberikan keseimbangan nutrisi yang optimal bagi pertumbuhan bibit. Penelitian ini telah dilaksanakan di lahan Percobaan Fakultas Pertanian Universitas Islam Sumatra Utara, Jln. Karya Wisata, Gedung Johor, Kecamatan Medan Johor, Kota Medan, ketinggian tempat ± 35 meter di atas permukaan laut. Penelitian ini dimulai pada Bulan Januari sampai April 2025 menggunakan bibit kelapa sawit varietas DxP PPKS 540 yang ditanam pada media tanah *Ultisol* dalam polybag.

Penelitian ini bertujuan untuk mendapatkan Pupuk Organik Cair berasal dari eceng gondok Plus Cu, Zn, dan B sebagai agroteknologi alternatif. Mempelajari pengaruh pemberian POC Eceng Gondok Plus terhadap tanaman kelapa sawit pre-nursery ditanah ultisol. Mempelajari pengaruh pemberian pupuk NPK pada tanaman kelapa sawit pre-nursery ditanah *Ultisol*. Mempelajari pengaruh interaksi pemberian POC Eceng Gondok Plus Cu, Zn dan B dengan Pupuk NPK pada pertumbuhan bibit kelapa sawit Pre-nursery. Efisiensi POC Eceng Gondok Plus Cu, Zn, B terhadap NPK pada pembibitan kelapa sawit. Penelitian ini menggunakan Rancangan Acak Kelompok (RAK) faktorial yang terdiri dari dua faktor. Faktor pertama yaitu Pupuk Organik Cair (POC) Eceng Gondok Plus Cu, Zn dan B yang terdiri atas 4 taraf, yakni: E_0 = Tanpa perlakuan; E_1 = 150 ml/Tanaman; E_2 = 200 ml/Tanaman; E_3 = 250 ml/Tanaman. Faktor kedua yaitu pupuk NPK mutiara yang terdiri dari 4 tara, yakni: N_0 = Tanpa Perlakuan; N_1 = 2,5 g/Tanaman; N_2 = 5 g/Tanaman; N_3 = 7,5 g/Tanaman. Variabel pengamatan yaitu terdiri dari tinggi bibit, jumlah daun, diameter batang, luas daun, jumlah klorofil daun, bobot segar tanaman, dan bobot kering tanaman.

Berdasarkan hasil penelitian menunjukkan bahwa POC eceng gondok sebagai sumber pupuk organik cair mengandung unsur mikro Zn (24 ppm) dengan kategori sedang dan Cu (1 ppm), namun memiliki keterbatasan pada kandungan unsur hara makro yang rendah serta pH sangat masam (3,54), sehingga diperlukan formulasi lanjutan untuk mengoptimalkan kualitas sebagai alternatif yang efektif. POC eceng gondok Plus Cu, Zn dan B berpengaruh nyata dalam meningkatkan tinggi bibit, luas daun, bobot segar, dan bobot kering tanaman, namun tidak

berpengaruh terhadap jumlah daun, diameter batang, dan kandungan klorofil daun. Perlakuan terbaik diperoleh pada pemberian POC eceng gondok plus Cu, Zn, B, sebanyak 250 ml. Pupuk NPK Mutiara berpengaruh nyata terhadap pertumbuhan tinggi bibit, jumlah daun, diameter batang, kandungan klorofil daun, bobot segar, dan bobot kering tanaman, tetapi tidak berpengaruh terhadap luas daun. Perlakuan terbaik terdapat pada dosis pupuk NPK Mutiara 7,5 g. Interaksi antara POC eceng gondok plus Cu, Zn, B, dan pupuk NPK Mutiara berpengaruh nyata dalam meningkatkan luas daun dan bobot kering tanaman, Kombinasi perlakuan terbaik terdapat pada POC eceng gondok 250 ml dengan pupuk NPK Mutiara 7,5 g. Namun POC eceng gondok belum sepenuhnya dapat menggantikan peran pupuk NPK. POC eceng gondok dapat berkontribusi sebagai suplemen pupuk, khususnya dalam menyediakan unsur mikro dan meningkatkan efisiensi penggunaan pupuk NPK. Namun, belum mampu menggantikan sepenuhnya peran pupuk NPK, terutama dalam penyediaan unsur hara makro utama yang dibutuhkan tanaman dalam jumlah besar.

Kata Kunci : Kelapa Sawit, Pembibitan Pre-Nursery, POC Eceng Gondok, Pupuk NPK dan Pertumbuhan Tanaman.

SUMMARY

Oil palm (Elaeis guineensis Jacq.) is a major plantation commodity with strategic economic value for Indonesia. Improving the quality of oil palm seedlings at the pre-nursery stage can be achieved through the optimization of organic and inorganic fertilization on ultisol planting media. Water hyacinth (Eichhornia crassipes) liquid organic fertilizer (LOF), enriched with micronutrients such as Cu, Zn, and B, has the potential to serve as an environmentally friendly alternative agrotechnology to support optimal seedling growth. Water hyacinth is an aquatic weed that can be processed into liquid organic fertilizer containing macro and micronutrients. Its combination with NPK fertilizer is expected to provide a balanced nutrient supply to support seedling development. This research was conducted at the Experimental Field of the Faculty of Agriculture, Islamic University of North Sumatra, located on Jln. Karya Wisata, Gedung Johor, Medan Johor District, Medan City, at an altitude of approximately 35 meters above sea level. The study was carried out from January to April 2025 using $D \times P = T$ variety oil palm seedlings, which were grown in polybags filled with ultisol soil media.

This study aims to develop liquid organic fertilizer derived from water hyacinth enriched with micronutrients Cu, Zn, and B (referred to as POCem) as an alternative agrotechnology. The objectives are to examine the effect of POCem application on oil palm seedlings in the pre-nursery stage grown on ultisol soil; to evaluate the effect of NPK fertilizer application on pre-nursery oil palm seedlings; to analyze the interaction between POCem enriched with Cu, Zn, and B and NPK fertilizer on the growth of pre-nursery oil palm seedlings; and to assess the efficiency of POCem relative to NPK during oil palm seedling development. The study used a factorial randomized block design (RBD) consisting of two factors. The first factor was water hyacinth liquid organic fertilizer (POC), which included four levels: E_0 = no application; E_1 = 150 ml/plant; E_2 = 200 ml/plant; and E_3 = 250 ml/plant. The second factor was NPK Mutiara fertilizer, also at four levels: N_0 = no application; N_1 = 2.5 g/plant; N_2 = 5 g/plant; and N_3 = 7.5 g/plant. The observed variables included seedling height, number of leaves, stem diameter, leaf area, leaf chlorophyll content, fresh plant weight, and dry plant weight.

The results of the study indicate that water hyacinth liquid organic fertilizer (POC) contains the micronutrients Zn (24 ppm), categorized as moderate, and Cu (1 ppm). However, it has limitations in terms of low macronutrient content and a very acidic pH (3.54), suggesting that further formulation is necessary to optimize its quality as an effective alternative fertilizer. The application of water hyacinth POC enriched with Cu, Zn, and B had a significant effect on increasing seedling height, leaf area, fresh weight, and dry weight of the plants, although it had no significant effect on the number of leaves, stem diameter, or leaf chlorophyll content. The best results were obtained with the application of 250 ml of enriched

POC. NPK Mutiara fertilizer significantly affected seedling height, number of leaves, stem diameter, leaf chlorophyll content, fresh weight, and dry weight, but did not have a significant impact on leaf area. The optimal results were achieved with a dosage of 7.5 g of NPK Mutiara. The interaction between water hyacinth POC (plus Cu, Zn, and B) and NPK Mutiara significantly improved leaf area and plant dry weight. The best combination treatment was 250 ml of water hyacinth POC with 7.5 g of NPK Mutiara. However, water hyacinth POC has not yet been able to fully replace the role of NPK fertilizer. It may serve as a supplementary fertilizer, particularly in supplying essential micronutrients and improving the efficiency of NPK fertilizer use. Nonetheless, it is not yet capable of fully substituting NPK fertilizer, especially in providing the primary macronutrients required by plants in large quantities.

Keywords: *Oil Palm, Pre-Nursery Seedlings, Water Hyacinth LOF, NPK Fertilizer, Plant Growth.*