

PEMODELAN MATEMATIK PERTUMBUHAN TANAMAN PADI (*Oryza sativa*) DENGAN PERLAKUAN PUPUK *SLURRY* BIOGAS

INTISARI

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Tujuan dari penelitian ini adalah mengamati dan mengukur pertumbuhan tanaman padi yang diberi pupuk *slurry* biogas, menghitung laju pertumbuhan dengan model matematik yang sesuai, dan merekomendasikan dosis pupuk *slurry* biogas untuk budidaya tanaman padi. Penelitian ini dilakukan di lahan percobaan menggunakan pot tanaman dengan 5 perlakuan pemberian pupuk *slurry* biogas yaitu tanpa perlakuan/kontrol (K), 60 ton/ha *slurry* cair (C1), 30 ton/ha *slurry* cair (C2), 60 ton/ha *slurry* padat (P1), dan 30 ton/ha *slurry* padat (P2). Masing – masing perlakuan diulang sebanyak 2 kali dengan tiap pot tanaman diisi 3 tanaman padi. Metode penelitian menggunakan rancangan blok lengkap. Parameter pertumbuhan yang diamati yaitu jumlah daun, tinggi tanaman, jumlah anakan, berat tajuk, dan berat akar tanaman. Pengamatan dilakukan selama 120 hari. Analisis yang digunakan dalam penelitian menggunakan analisis anova satu arah, regresi linear dan pemodelan persamaan logistik untuk laju pertumbuhan tanaman. Hasil penelitian didapatkan bahwa perlakuan P1 memiliki respon pertumbuhan yang paling baik. Nilai koefisien laju pertumbuhan tanaman pada parameter jumlah daun perlakuan K, C1, C2, P1, dan P2 berturut – turut sebesar -0,044; -0,047; -0,0567; -0,0613; dan -0,0547. Kemudian pada parameter tinggi tanaman berturut – turut sebesar -0,0448; -0,0474; -0,0448; -0,0421; dan -0,0458. Serta nilai parameter jumlah anakan berturut – turut sebesar -0,0408; -0,0405; -0,0432; -0,0447; dan -0,0448. Uji anova dilakukan menunjukkan bahwa pemberian pupuk *slurry* biogas signifikan ($\text{sign} < 0,05$) terhadap laju pertumbuhan tanama, sedangkan tidak berpengaruh nyata pada berat basah dan kering tajuk serta akar tanaman ($\text{sign} > 0,05$). Pemodelan pertumbuhan tanaman padi dapat menggunakan model persamaan logistik dengan nilai koefisien determinasi $R^2 > 0,8$. Penelitian ini merekomendasikan dosis pupuk *slurry* biogas 60 ton/ha untuk budidaya padi.

Kata Kunci: *Oryza sativa*, pupuk *slurry* biogas, laju pertumbuhan tanaman, persamaan logistik

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MATHEMATICAL MODELING FOR RICE (*Oryza sativa*) GROWTH ANALYSIS UNDER SLURRY BIOGAS FERTILIZER

ABSTRACT

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The purposes of this study were to observe and measure the growth of rice plants against the application of biogas slurry fertilizer, to calculate the growth rate of rice plants with an appropriate mathematical model, and to recommend a dose of biogas slurry fertilizer for rice cultivation. This study was conducted in an experimental field using plant pots with 5 treatments of applying biogas slurry, namely without treatment/control (K), 60 Mg/ha of liquid slurry (C1), 30 Mg/ha of liquid slurry (C2), 60 Mg/ha of solid slurry (P1), and 30 Mg/ha of solid slurry (P2). Each treatment was repeated 2 times with each plant pot filled with 3 rice plants. The pots were set in randomized complete block design. The growth parameters observed were the number of leaves, plant height, number of tillers, crown weight, and plant root weight. Observations were made for 120 days. The analysis used in this study used one-way ANOVA analysis, linear regression and logistic equation modeling for plant growth rates. The results showed that the P1 treatment had the best growth response. The coefficient value of plant growth rate (μ) on the number of leaves treatment parameters K, C1, C2, P1, and P2 were -0.044; -0.047; -0.0567; -0.0613; and -0.0547, respectively. Then, the plant height parameters were -0.0448; -0.0474; -0.0448; -0.0421; and -0.0458, respectively. The number of tillers in a row were -0.0408; -0.0405; -0.0432; -0.0447; and -0.0448, respectively. The ANOVA test showed that the application of biogas slurry fertilizer was significant (sign < 0.05) on plant growth rate, while it had no significant effect on wet and dry weight of shoots and plant roots (sign > 0.05). Mathematical modeling of logistic equation was excellent to describe rice growth under biogas slurry fertilizer. The dose of slurry biogas fertilizer that provides the most contact for plants was 60 Mg/ha.

Keywords: *Oryza sativa*, slurry biogas fertilizer, plant growth rate, logistic equation

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