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**Pengaruh Kombinasi Hidrogel Polimer, Nano Silika, dan K-Humat pada Morfologi Perakaran dan Biomassa
Tebu (Saccharum officinarum L.)**
Kartika Shela Winanci, Dr. Eka Tarwaca Susila Putra, S.P., M.P.; Prof. Dr. Ir. Taryono, M.Sc.
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INTISARI

Tebu (*Saccharum officinarum* L.) merupakan komoditas penting dalam produksi gula nasional, namun produktivitasnya masih dipengaruhi kesuburan tanah dan efisiensi hara. Tebu dapat dipanen berulang ulang, apabila dikepras. Tebu kepras I biasanya memberikan produktivitas terbaik, sehingga dianggap paling tanggap terhadap peningkatan kesuburan lahan. Penelitian ini bertujuan untuk mengkaji pengaruh kombinasi hidrogel polimer, nano silika (SiNPs), dan K-humat terhadap perakaran dan biomassa tebu kepras 1 varietas Bululawang serta mengidentifikasi kecenderungan perlakuan yang menunjukkan tanggapan lebih baik berdasarkan performa perakaran, batang, serta hasil biomassa. Penelitian menggunakan Rancangan Acak Kelompok Lengkap (RAKL) dengan tujuh perlakuan (T0–T6). Peubah yang diamati meliputi analisis kimia tanah, analisis jaringan akar dan batang, karakteristik perakaran (volume, panjang, luas permukaan, dan bobot akar) serta biomassa batang (panjang, diameter, jumlah ruas, dan bobot segar). Data dianalisis menggunakan ANOVA dan regresi linear berganda bertahap (*stepwise regression analysis*). Hasil menunjukkan bahwa seluruh perlakuan memberikan tanggapan yang berbeda dengan perlakuan T6 sebagai yang terbaik pada sebagian besar peubah. Analisis regresi bertahap memberikan hasil bahwa panjang dan diameter batang merupakan faktor utama pembentuk biomassa. Secara keseluruhan, kombinasi hidrgel, nano silika, dan k-humat terbukti meningkatkan biomassa batang tebu melalui perbaikan kondisi tanah dan optimalisasi fungsi perakaran.

Kata kunci: tebu ratoon, hidrogel, nano silika, K-humat, perakaran, biomassa.

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ABSTRACT

Sugarcane (*Saccharum officinarum* L.) is an important commodity for national sugar production, although its productivity is still influenced by soil fertility and nutrient use efficiency. Sugarcane can be harvested repeatedly through the ratoon system, and the first ratoon generally produces the highest yield and is considered the most responsive to improvements in soil fertility. This study aims to examine the effect of a combination of polymer hydrogel, nano-silica (SiNPs), and K-humate on the root system and biomass of the Bululawang variety of early-maturing sugarcane, as well as to identify treatment trends that show better responses based on root system performance, stem characteristics, and biomass yield. The study employed a completely randomized block design (CRBD) with seven treatments (T0–T6). The variables observed included soil chemical analysis, root and stem tissue analysis, root characteristics (volume, length, surface area, and root weight), and stem biomass (length, diameter, number of nodes, and fresh weight). Data were analyzed using analysis of variance (ANOVA) and stepwise multiple linear regression. The results showed that all treatments produced different responses, with T6 exhibiting the best performance in most observed variables. Stepwise regression analysis indicated that stalk length and stalk diameter were the primary factors contributing to fresh stalk biomass. These findings demonstrate that the combined application of hydrogel, silica nanoparticles, and potassium humate was shown to increase sugarcane stalk biomass by improving soil conditions and optimizing root function.

Keywords: sugarcane ratoon, hydrogel, silica nanoparticles, potassium humate, root system, biomass.