

RINGKASAN

Penggunaan traktor roda 4 dapat mempermudah proses pengolahan tanah agar lebih efisien. Namun, penggunaan traktor roda 4 pada lahan juga dapat menimbulkan pemadatan tanah yang dapat menghambat pertumbuhan tanaman, penetrasi akar tanaman, serta pergerakan air dan udara di dalam tanah. Namun, kajian tentang pengaruh tekanan angin, khususnya traktor roda 4, terhadap pemadatan tanah masih belum banyak dilakukan. Penelitian terdahulu hanya mengkaji dampak tekanan angin roda traktor roda 4 pada kedalaman 0 – 30 cm saja. Maka dari itu penelitian ini dilakukan dengan tujuan (1) mengkaji pengaruh perbedaan tekanan angin roda traktor roda 4 terhadap tingkat kepadatan tanah pada kedalaman tanah 0 – 50 cm, (2) dan mengkaji hubungan antara beberapa variabel sifat fisik tanah terkait dengan pengaruh tekanan angin roda traktor roda 4 terhadap tingkat kepadatan tanah pada kedalaman 0 – 50 cm.

Penelitian dilaksanakan pada bulan Desember – Juni 2024 di lahan pertanian Unit Penyewaan Jasa Alsintan (UPJA) Kecamatan Sokaraja dan Laboratorium Terpadu 1 IAB, Universitas Jenderal Soedirman. Bahan yang digunakan adalah 4 petakan lahan ukuran 2 m x 2 m, sedangkan alat yang digunakan meliputi: traktor roda 4, *pressure gauge*, *head core ring sampler*, *soil ring sampler* 100 cm³, *oven*, jangka sorong, timbangan digital, cawan aluminium, *falling head* meter, dan *stopwatch*. Penelitian dilakukan menggunakan Rancangan Acak Lengkap (RAL) dengan satu faktor/perlakuan dan satu kontrol sebagai pembanding. Perlakuan yang diberikan yaitu 4 tingkat tekanan angin roda traktor roda 4 yang terdiri dari: (T₀) tanpa lintasan traktor, (T₇) 7 psi, (T₁₅) 15 psi, dan (T₂₀) 20 psi. Pengambilan sampel tanah tidak terganggu dilakukan pada kedalaman 0 – 10, 10 – 20, 20 – 30, 30 – 40, dan 40 – 50 cm. Pada masing-masing kedalaman tanah dilakukan 5 kali ulangan pengambilan sampel tanah, sehingga jumlah total sampel tanah yang diambil adalah 100 sampel tanah. Variabel sifat fisik tanah yang diukur yaitu konduktivitas hidrolik jenuh, *dry bulk density*, porositas tanah dan kadar air tanah. Analisis data menggunakan analisis regresi serta *Analysis of Variance* (ANOVA) dengan uji lanjut menggunakan uji *Duncan's Multiple Range Test* (DMRT) 5%.

Hasil penelitian menunjukkan bahwa peningkatan tekanan angin roda traktor roda 4 cenderung menyebabkan peningkatan nilai *dry bulk density*, yang diikuti dengan penurunan nilai konduktivitas hidrolik jenuh, porositas, dan kadar air tanah. Peningkatan kedalaman tanah cenderung menghasilkan penurunan nilai *dry bulk density*, yang diikuti dengan peningkatan nilai konduktivitas hidrolik jenuh, porositas, dan kadar air. Hasil regresi menunjukkan *dry bulk density* memiliki hubungan yang berbanding terbalik dengan konduktivitas hidrolik jenuh, sedangkan porositas dan kadar air memiliki hubungan yang berbanding lurus dengan konduktivitas hidrolik jenuh.

SUMMARY

The use of four-wheel tractors can facilitate the soil processing process to be more efficient. However, the use of four-wheel tractors on land can also lead to soil compaction, which can hinder plant growth, root penetration, as well as the movement of water and air within the soil. Nevertheless, studies on the impact of tire pressure, specifically from four-wheel tractors, on soil compaction have not been extensively conducted. Previous research has only examined the effects of tire pressure from four-wheel tractors at a depth of 0 to 30 cm. Therefore, this study was conducted with the objectives of (1) examining the effect of different tire pressures of four-wheel tractors on soil density at a depth of 0 to 50 cm, and (2) investigating the relationship between several physical soil property variables related to the effect of tire pressure from four-wheel tractors on soil density at a depth of 0 to 50 cm.

The research was conducted from December to June 2024 in agricultural land of the Unit Penyewaan Jasa Alsintan (UPJA) in Sokaraja District and the Integrated Laboratory 1 of Jenderal Soedirman University. The materials used included four plots of land measuring 2 m x 2 m, while the equipment used comprised a four-wheel tractor, pressure gauge, head core ring sampler, soil ring sampler (100 cm³), oven, caliper, digital scale, aluminum dish, falling head meter, and stopwatch. The study was carried out using a Completely Randomized Design (CRD) with one factor/treatment and one control as a comparison. The treatments applied included four levels of tire pressure from the four-wheel tractor, consisting of: (T0) without tractor tracks, (T7) 7 psi, (T15) 15 psi, and (T20) 20 psi. Undisturbed soil samples were taken at depths of 0–10, 10–20, 20–30, 30–40, and 40–50 cm. At each soil depth, five repetitions of soil sampling were conducted, resulting in a total of 100 soil samples. The measured physical soil property variables included saturated hydraulic conductivity, dry bulk density, soil porosity, and soil moisture content. Data analysis was performed using regression analysis and Analysis of Variance (ANOVA) with further testing using Duncan's Multiple Range Test (DMRT) at 5%.

The results of the study indicate that an increase in tire pressure from the four-wheel tractor tends to cause an increase in dry bulk density, followed by a decrease in saturated hydraulic conductivity, porosity, and soil moisture content. An increase in soil depth tends to result in a decrease in dry bulk density, followed by an increase in saturated hydraulic conductivity, porosity, and soil moisture content. Regression results show that dry bulk density has an inverse relationship with saturated hydraulic conductivity, while porosity and soil moisture content have a direct relationship with saturated hydraulic conductivity.

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