

RINGKASAN

Pengolahan tanah menggunakan traktor roda 2 dapat meningkatkan efisiensi kerja, namun juga dapat menyebabkan pemadatan tanah yang berdampak buruk pada sifat fisik tanah dan pertumbuhan tanaman. Tekanan angin pada roda traktor roda 2 dapat memengaruhi tingkat pemadatan, porositas, dan kadar air tanah. Kajian mengenai pengaruh tekanan angin traktor roda 2 masih belum banyak dilakukan. Sebagian besar penelitian sebelumnya meneliti hanya hingga kedalaman 40 cm dalam jangka pendek (< 6 bulan) setelah perlintasan traktor. Oleh sebab itu, penelitian ini dilakukan dengan tujuan: (1) mengkaji pengaruh perbedaan tekanan angin roda traktor roda 2 terhadap tingkat pemadatan tanah pada kedalaman 0 – 50 cm pada saat 12 bulan setelah perlintasan traktor roda 2, (2) mengkaji hubungan antar variabel sifat fisik tanah terkait pengaruh perbedaan tekanan angin roda traktor roda 2 terhadap tingkat pemadatan tanah pada kedalaman 0 – 50 cm pada saat 12 bulan setelah perlintasan traktor roda 2, (3) mengkaji pengaruh waktu terhadap tingkat pemadatan tanah pada kedalaman 0 – 50 cm pada saat 12 bulan pengamatan dengan 6, dan 0 bulan pengamatan.

Penelitian dilaksanakan pada bulan Januari 2025 – Juli 2025 di lahan pertanian Usaha Pelayanan Jasa Alsintan (UPJA) Kecamatan Sokaraja, Laboratorium Terpadu 1 IAB, dan Laboratorium Tanah BPSIP Yogyakarta. Bahan yang digunakan adalah 4 plot penelitian dengan ukuran 1 m x 2 m, sedangkan alat yang digunakan meliputi: traktor roda 2, *pressure gauge*, *head core ring sampler*, *soil ring sampler* 100 cm³, oven, jangka sorong, timbangan digital, cawan alumunium, *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 2: tanpa perlintasan traktor (T_0), 7 psi (T_7), 10 psi (T_{10}), dan 12 psi (T_{12}). Sampel tanah tidak terganggu diambil pada kedalaman 0 – 10, 10 – 20, 20 – 30, 30 – 40, dan 40 – 50 cm. Pada masing-masing kedalaman tanah dilakukan 5 kali ulangan sehingga jumlah total sampel tanah yang diambil adalah 100. Variabel sifat fisik tanah yang diukur yaitu konduktivitas hidrolik jenuh, *dry bulk density*, *wet bulk density*, porositas tanah, dan kadar air tanah. Analisis data menggunakan *Analysis of Variance* (ANOVA) dengan uji lanjut menggunakan uji *Duncan's Multiple Range Test* (DMRT) 5% dan analisis regresi.

Hasil penelitian menunjukkan bahwa peningkatan tekanan angin roda traktor roda 2 menghasilkan peningkatan nilai *dry bulk density*, serta penurunan nilai porositas, kadar air, dan konduktivitas hidrolik jenuh. Sementara itu, peningkatan kedalaman tanah menghasilkan penurunan nilai *dry bulk density*, serta peningkatan nilai porositas, kadar air, dan konduktivitas hidrolik jenuh. Hasil analisis regresi menunjukkan bahwa *dry bulk density* memiliki hubungan negatif dengan konduktivitas hidrolik jenuh, sedangkan porositas dan kadar air tanah menunjukkan hubungan positif terhadap konduktivitas hidrolik jenuh. Apabila dibandingkan terhadap data 6 dan 0 bulan pengamatan setelah perlintasan traktor, data 12 bulan pengamatan menunjukkan bahwa nilai *dry bulk density* mengalami peningkatan, sedangkan nilai porositas, kadar air, dan konduktivitas hidrolik jenuh mengalami penurunan.

SUMMARY

Tillage using a 2-wheel tractor can improve work efficiency, but it can also cause soil compaction that adversely affects soil physical properties and plant growth. Wind pressure on the wheels of a 2-wheel tractor can affect the degree of compaction, porosity and moisture content of the soil. Studies on the effect of 2-wheel tractor wind pressure have not been conducted. Most of the previous studies examined only up to a depth of 40 cm in the short term (< 6 months) after tractor crossings. Therefore, this study was conducted with the aim of: (1) to study the effect of different wind pressures of 2-wheel tractor wheels on the level of soil compaction at a depth of 0-50 cm at 12 months after the crossing of 2-wheel tractors, (2) to study the relationship between soil physical properties variables related to the effect of different wind pressures of 2-wheel tractor wheels on the level of soil compaction at a depth of 0-50 cm at 12 months after the crossing of 2-wheel tractors, and (3) assessing the effect of time on soil compaction levels at a depth of 0–50 cm during 12 months of observation with 6 and 0 months of observation .

The research was conducted in January 2025 - July 2025 on the farm of Alsintan Service Business (UPJA) Sokaraja District, Integrated Laboratory 1 IAB, and Soil Laboratory BPSIP Yogyakarta. The materials used were 4 research plots with a size of 1 m x 2 m, while the tools used included: 2-wheel tractor, pressure gauge, head core ring sampler, soil ring sampler 100 cm³, oven, vernier, digital scales, aluminum cup, falling head meter, and stopwatch. The research was conducted using a completely randomized design (CRD) with one factor/treatment and one control as a comparison. The treatments were 4 levels of 2-wheel tractor wheel wind pressure: without tractor crossing (T_0), 7 psi (T_7), 10 psi (T_{10}), and 12 psi (T_{12}). Undisturbed soil samples were taken at depths of 0 - 10, 10 - 20, 20 - 30, 30 - 40, and 40 - 50 cm. At each soil depth, 5 replicates were conducted so that the total number of soil samples taken was 100. The measured soil physical properties were saturated hydraulic conductivity, dry bulk density, wet bulk density, soil porosity, and soil moisture content. Data were analyzed using Analysis of Variance (ANOVA) with further tests using Duncan's Multiple Range Test (DMRT) 5% and regression analysis.

The results showed that increasing the wind pressure of 2-wheel tractor wheels resulted in an increase in dry bulk density values, as well as a decrease in porosity, moisture content, and saturated hydraulic conductivity values. Meanwhile, an increase in soil depth results in a decrease in dry bulk density value, as well as an increase in porosity, moisture content, and saturated hydraulic conductivity. Regression analysis results showed that dry bulk density had a negative relationship with saturated hydraulic conductivity, while porosity and soil moisture content showed a positive relationship with saturated hydraulic conductivity. When compared to the 6 and 0 month observation data after tractor crossings, the 12 month observation data showed that the dry bulk density value increased, while the porosity, moisture content, and saturated hydraulic conductivity values decreased.