

RINGKASAN

Pengolahan tanah menggunakan traktor dapat meningkatkan efisiensi dan produktivitas kerja. Namun, penggunaan traktor dalam pengolahan tanah dapat menyebabkan pemadatan tanah. Pengaturan tekanan angin yang tepat pada roda traktor dapat mengurangi kerusakan struktur tanah dan menghindari kompaksi berlebihan yang dapat merugikan sistem akar tanaman serta sirkulasi air dalam tanah. Meskipun demikian, penelitian yang membahas terkait pengaruh tingkat tekanan angin roda traktor, khususnya traktor roda dua terhadap pemadatan tanah masih belum banyak dilakukan. Penelitian terdahulu hanya mengkaji pengaruh tingkat tekanan angin roda pada kedalaman tanah 0 – 40 cm saja. Oleh karena itu, penelitian ini bertujuan untuk (1) mengkaji pengaruh perbedaan tekanan angin roda traktor roda dua terhadap pemadatan tanah pada kedalaman tanah 0 – 50 cm, dan (2) mengkaji hubungan antara variabel sifat fisik tanah terkait pengaruh perbedaan tekanan angin roda traktor roda dua terhadap pemadatan tanah pada kedalaman tanah 0 – 50 cm.

Penelitian dilaksanakan pada bulan Desember 2023 – Juni 2024 di lahan pertanian Unit Penyewaan Jasa Alsintan (UPJA) Kecamatan Sokaraja dan Laboratorium Terpadu 1 IAB, Universitas Jenderal Soedirman. Bahan yang digunakan yaitu 4 petakan lahan ukuran 2 m x 1 m, sedangkan alat yang digunakan meliputi: traktor roda dua tipe Quick/G 3000 Zeva, *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 taraf perlakuan tekanan angin roda traktor roda dua yang terdiri dari: Tidak diberikan perlintasan (T₀), 7 psi (T₇), 10 psi (T₁₀), dan 12 psi (T₁₂). 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 hidrolis jenuh, *dry bulk density*, porositas tanah, kadar air tanah, dan *wet bulk density*. 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 dua menyebabkan penurunan nilai konduktivitas hidrolis jenuh, porositas tanah, dan kadar air tanah, yang sejalan dengan peningkatan nilai *dry bulk density*. Peningkatan kedalaman tanah cenderung menghasilkan penurunan nilai *dry bulk density*, yang diikuti dengan peningkatan nilai konduktivitas hidrolis jenuh, porositas tanah, dan kadar air tanah. Hasil regresi menunjukkan bahwa peningkatan nilai *dry bulk density* dapat menyebabkan penurunan nilai konduktivitas hidrolis jenuh dan porositas tanah, sedangkan peningkatan nilai porositas dan kadar air tanah dapat menyebabkan peningkatan nilai konduktivitas hidrolis jenuh.

SUMMARY

The use of tractors in soil processing can increase efficiency and productivity. However, the use of tractors in soil processing can cause soil compaction. Proper air pressure setting on the tractor wheels can reduce soil damage and prevent excessive compaction that can harm plant root systems and soil water circulation. Despite this, research that discusses the effect of tractor wheel air pressure levels, especially two-wheeled tractors on soil compaction, has not been conducted. Previous research only examined the effect of wheel air pressure levels at a soil depth of 0 – 40 cm. Therefore, this research aims to (1) investigate the effect of different air pressure levels on soil compaction at a depth of 0 – 50 cm, and (2) investigate the relationship between soil physical properties related to the effect of different in air pressure between the wheels of a tractor and two wheel vehicle on soil compaction at a depth of 0 – 50 cm.

The research was conducted from December 2023 to June 2024 on the agricultural land of Unit Penyewaan Jasa Alsintan (UPJA) in Sokaraja and the Integrated Laboratory 1 IAB, University of Jenderal Soedirman. The materials used included 4 plots of land measuring 2 m x 1 m, while the equipment used included a tractor type Quick/G 3000 Zeva, pressure gauge, head core ring sampler, soil ring sampler 100 cm³, oven, measuring rod, digital balance, aluminum cup, falling head meter, and stopwatch. The research used a Complete Randomized Design (CRD) with one factor/treatment and one control as a comparison. The treatments given were 4 levels of air pressure on the tractor wheels, consisting of: no crossing (T₀), 7 psi (T₇), 10 psi (T₁₀), and 12 psi (T₁₂). Soil sampling was done without disturbance at depths of 0 – 10, 10 – 20, 20 – 30, 30 – 40, and 40 – 50 cm. Each depth was repeated 5 times, resulting in a total of 100 soil samples. The physical properties of soil measured were hydraulic conductivity, dry bulk density, soil porosity, soil water content, and wet bulk density. Data analysis used regression analysis and Analysis of Variance (ANOVA) with further testing using Duncan's Multiple Range Test (DMRT) 5%.

The research findings indicate that an increase in the tire pressure of a two-wheeled tractor causes a decrease in the hydraulic conductivity, soil porosity, and soil water content, which is in line with an increase in the dry bulk density. An increase in soil depth tends to result in a decrease in the dry bulk density, followed by an increase in the hydraulic conductivity, soil porosity, and soil water content. The regression results show that an increase in the dry bulk density leads to a decrease in the hydraulic conductivity and soil porosity, while an increase in soil porosity and water content leads to an increase in the hydraulic conductivity.