

RINGKASAN

Perlindungan traktor dapat menyebabkan terjadinya pemadatan tanah yang dapat mengubah sifat fisik tanah sehingga menghambat pertumbuhan akar dan pergerakan air serta udara dalam tanah. Dampak pemadatan tanah tersebut dapat dikurangi dengan menambahkan bahan organik berupa pupuk kandang sapi ke dalam tanah. Meskipun demikian, penelitian tentang pengaruh pemberian pupuk kandang sapi terhadap pemadatan tanah akibat perlindungan traktor roda 4 masih jarang dilakukan. Selain itu, analisis sifat fisik tanah pada penelitian sebelumnya dominan hanya dilakukan hingga kedalaman 30 cm saja. Sementara itu, beberapa jenis tanaman mempunyai sistem perakaran yang mampu menembus hingga kedalaman lebih dari 30 cm. Oleh karena itu, penelitian ini ditujukan untuk (1) mengetahui pengaruh dosis pupuk kandang sapi terhadap pemadatan tanah akibat perlindungan traktor roda 4 pada kedalaman 0 – 50 cm, serta (2) mempelajari hubungan antar variabel sifat fisik tanah terkait dengan pengaruh pemberian pupuk kandang sapi terhadap pemadatan tanah akibat perlindungan traktor roda 4 pada kedalaman 0 – 50 cm.

Penelitian dilaksanakan pada bulan Maret – Juli 2024 di lahan pertanian Desa Karangduren, Kecamatan Sokaraja, Kabupaten Banyumas serta lab Terpadu 1 IAB, Universitas Jenderal Soedirman. Dalam penelitian ini digunakan Rancangan Acak Lengkap (RAL) dengan 4 taraf perlakuan dosis pupuk kandang sapi, yaitu tanpa pupuk kandang sapi (P_0), 15 ton/ha (P_{15}), 20 ton/ha (P_{20}), dan 25 ton/ha (P_{25}). Alat yang akan digunakan dalam penelitian ini meliputi: Traktor roda 4, *head core ring sampler*, *soil ring sampler* ukuran 100 cm³, oven, jangka sorong (*vernier calliper*), timbangan digital, *falling head meter*, dan *stopwatch*. Sedangkan bahan yang akan digunakan dalam penelitian ini meliputi: pupuk kandang sapi dan 4 petakan lahan berukuran 2 m x 2 m. Sampel tanah tidak terganggu diambil pada kedalaman 0 – 10, 10 – 20, 20 – 30, 30 – 40, dan 40 – 50 cm, dengan jumlah ulangan yang diambil sebanyak 5 kali untuk setiap kedalaman, sehingga total sampel tanah yang diambil sebanyak 100 sampel. Variabel yang diukur adalah konduktivitas hidrolis jenuh, kadar air, *dry bulk density*, *wet bulk density*, dan porositas. Analisis data menggunakan *Analysis of Variance* (ANOVA) 5 % dengan uji lanjut menggunakan uji *Duncan's Multiple Range Test* (DMRT) 5% serta analisis regresi.

Hasil penelitian menunjukkan bahwa pemberian pupuk kandang sapi cenderung menghasilkan penurunan nilai *dry bulk density* dan *wet bulk density*, serta peningkatan nilai konduktivitas hidrolis jenuh, porositas, dan kadar air tanah. Demikian juga penambahan tingkat kedalaman tanah cenderung menghasilkan penurunan nilai *dry bulk density* dan *wet bulk density*, serta menghasilkan peningkatan nilai konduktivitas hidrolis jenuh, porositas, dan kadar air tanah dibanding dengan tanpa. Dosis pupuk kandang sapi 25 ton/ha paling efektif dalam mengurangi pemadatan tanah. Hasil analisis regresi menunjukkan hubungan antara beberapa variabel sifat fisik tanah, dimana *dry bulk density* berhubungan linear negatif dengan konduktivitas hidrolis jenuh dengan R^2 yaitu 0,6047, sedangkan porositas dan kadar air berhubungan linear positif dengan konduktivitas hidrolis jenuh dengan nilai R^2 masing-masing yaitu 0,6047 dan 0,5431.

SUMMARY

Tractor passes can cause soil compaction which can change the physical properties of the soil, inhibiting root growth and the movement of water and air in the soil. The impact of soil compaction can be reduced by adding organic matter in the form of cow manure to the soil. However, research on the effect of applying cow manure on soil compaction due to 4-wheel tractor crossings is still rare. In addition, the analysis of soil physical properties in previous studies was dominantly only carried out to a depth of 30 cm. Meanwhile, some plants have root systems that can penetrate to a depth of more than 30 cm. Therefore, this study aimed to (1) determine the effect of cow manure dosage on soil compaction due to 4-wheel tractor crossings at a depth of 0 – 50 cm, and (2) study the relationship between soil physical properties variables related to the effect of cow manure application on soil compaction due to 4-wheel tractor crossings at a depth of 0 – 50 cm.

The research was conducted from March to July 2024 in the farmland of Karangduren Village, Sokaraja Subdistrict, Banyumas Regency and Integrated Lab 1 IAB, Jenderal Soedriman University. This study used a completely randomized design (CRD) with 4 levels of treatment of cow manure doses, namely without cow manure (P₀), 15 ton/ha (P₁₅), 20 ton/ha (P₂₀), and 25 ton/ha (P₂₅). Tools that will be used in this research include: 4-wheel tractor, head core ring sampler, soil ring sampler size 100 cm³, oven, vernier calliper, digital scale, falling head meter, and stopwatch. While the materials that will be used in this study include: cow manure and 4 plots measuring 2 m x 2 m. Undisturbed soil samples were taken at depths of 0 - 10, 10 - 20, 20 - 30, 30 - 40, and 40 - 50 cm, with the number of replicates taken 5 times for each depth, so that a total of 100 soil samples were taken. The variables measured were saturated hydraulic conductivity, moisture content, dry bulk density, wet bulk density, and porosity. Data were analyzed using Analysis of Variance (ANOVA) 5% with further tests using Duncan's Multiple Range Test (DMRT) 5% and regression analysis.

The results showed that the application of cow manure tends to produce a decrease in the value of dry bulk density and wet bulk density, as well as an increase in the value of saturated hydraulic conductivity, porosity, and soil moisture content. Likewise, the addition of soil depth level tends to produce a decrease in the value of dry bulk density and wet bulk density, and produce an increase in the value of saturated hydraulic conductivity, porosity, and soil moisture content compared to without. The 25 ton/ha dose of cow manure is most effective in reducing soil compaction. Regression analysis results showed the relationship between several variables of soil physical properties, where dry bulk density was negatively linearly related to saturated hydraulic conductivity with R² of 0.6047, while porosity and moisture content were positively linearly related to saturated hydraulic conductivity with R² values of 0.6047 and 0.5431, respectively.