ABSTRACT

The increasing use of agricultural machines in most mechanized farming fields has led to amplified soil compaction levels due to wheel traffic. Since wheel traffic is still underestimated, the main objective of this research was to determine the effect of wheel traffic on soil physical properties. This research determined the effect of wheel traffic on bulk density, soil texture, porosity, infiltration rate, hydraulic conductivity, and cone index using a field experiment at Egerton University Tatton Farm. A walking tractor was used to provide traffic loads. The experiment was conducted in a completely randomized design (CRD) with three weight applications and three traffic locations. The treatments were 1.72 kN (one tractor pass), 5.15 kN (three tractor passes) and 8.09 kN (five tractor passes) and three traffic locations, which are traffic on rows (TR), traffic between rows (TB) and traffic on the entire row (TE), replicated three times. Average moisture contents of the soil for depth ranges of 0 to 15 cm, 16 to 30 cm and 31 to 45 cm were recorded as 23%, 25% and 27%, respectively. The applied weight significantly increased bulk density and cone index but decreased infiltration rate, hydraulic conductivity and porosity. Bulk density increased by 17%, 15% and 8%, cone index increased by 44%, 10% and 7%, and porosity decreased by 25%, 23% and 36% for the three depth ranges after the three weight treatments were applied, respectively. Hydraulic conductivity decreased from 65.2 cm/day, 50.98 cm/day, and 34.05 cm/day to 13.95 cm/day, while infiltration rates decreased from 0.047 cm/min, 0.031 cm/min, and 0.018 cm/min. TE had the highest bulk density as compared to TB and TR. Analysis of variance indicated changes in weight applied, traffic location, and depth with significant effects on soil properties at a 5% level of confidence. It was concluded that wheel traffic causes soil compaction at varying levels depending on the applied weight, thus affecting the soil physical properties. This suggests that decreased and controlled wheel traffic could be a promising way to alleviate soil compaction.