ABSTRACT

A study to evaluate the effects of biochar and wood vinegar on soil properties, fall armyworm severity, and sorghum yield was carried out in a semi-arid area of Koibatek, Baringo County, Kenya. Experiments were conducted over three seasons (2022–2024) using a randomized complete block design (RCBD) replicated three times. The combined biochar and wood vinegar treatment (T4) consistently recorded the lowest soil bulk density (1.12 g cm−3), highest soil water content (25.2%), organic carbon (3.1%), available phosphorus (26.6 mg kg−1), moderate pH (6.53), and total nitrogen (0.29%) across seasons. Microbial counts were also highest in T4 (3.01–3.55 log CFU g−1), while FAW severity was lowest (<5%) under T4 and the synthetic fertilizer + insecticide-treated control (T5) and highest (~70%) in the untreated control (T1). The highest grain yield (2.45 t ha−1) was recorded in T4, surpassing T5 (2.10 t ha−1) and the other treatments. Grain yield was positively correlated with tiller number (r = 0.94), soil water content (r = 0.88), and microbial counts (r = 0.94), but negatively correlated with bulk density (r = −0.96) and FAW severity(r = −0.94). These results demonstrate that combining biochar and wood vinegar provides synergistic benefits, enhancing soil fertility, reducing FAW severity, and improving sorghum productivity under semi-arid conditions.