

Effect of Scattered *Vachellia Tortilis* (Umbrella Torn) and *Vachellia nilotica* (Gum Arabic) Trees on Selected Physio-Chemical Properties of the Soil and Yield of Sorghum (*Sorghum bicolor* (L.) Moench) in Ethiopia

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Abstract : A significant portion of the Ethiopian landscape features scattered trees that are deliberately managed in crop fields to enhance soil fertility and crop yield in which the compatibility of crops with these trees varies depending on location, tree species, and annual crop type. This study aimed to examine the effects of scattered *Vachellia tortilis* and *Vachellia nilotica* trees on selected physico-chemical properties of the soil, as well as the yield and yield components of sorghum in Ethiopia. *Vachellia tortilis* and *Vachellia nilotica* were selected on abundance occurrence and managed in crop fields. A randomized complete block design was used, with a distance from the tree canopy (middle, edge, and outside) as a treatment, and five trees of each species served as replications. Sorghum was planted up to 15 meters in the east, west, south, and north directions from the tree trunk to assess growth and yield. Soil samples were collected from the two tree species, three distance factors, three soil depths(0-20cm, 20-40cm, and 40-60cm), and five replications, totaling 45 samples for each tree species. These samples were analyzed for physical and chemical properties. The results indicated that both *V. tortilis* and *V. nilotica* significantly affected soil physico-chemical properties and sorghum yield. Specifically, soil moisture content, EC, total nitrogen, organic carbon, available phosphorus and potassium, CEC, sorghum plant height, panicle length, biomass, and yield decreased with increasing distance from the canopy. Conversely, bulk density and pH increased. Under the canopy, sorghum yield increased by 66.4% and 53.5% for *V. tortilis* and *V. nilotica*, respectively, due to higher soil moisture and nutrient availability. The study recommends promoting trees in crop fields, management options for new saplings, and further research on root decomposition and nutrient supply.

Keywords : canopy, crop yield, soil nutrient, soil organic matter, yield components

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