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Combined Tied Ridge, Fertiliser Microdosing and Biochar Effects on Maize Production under Contrasting Water Supply

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Abstract

In many developing countries staple food production is limited due to soils with low agricultural potential, constraints in terms of fertiliser accessibility and low and/or erratic rainfall. There are well-known agricultural practices to meet those challenges: *In-situ* rainwater harvesting with tied ridges, fertiliser microdosing and biochar application to soil. However, their combinations have rarely been studied under varying irrigation frequencies.

We conducted a field trial in split-plot design on soil with low natural fertility in Tanzania over two seasons with contrasting water supply in 2016 and 2017. Tied ridges, chemical fertiliser microdosing (25 %) and maize cob biochar were applied and their effects on maize grain yield, biomass, plant height, leaf area index, and soil moisture content were investigated.

The slightly alkaline biochar provided P and K to the soil. Under low irrigation frequency, tied ridges conserved soil moisture and tended to increase yield. Fertiliser microdosing increased yield under both irrigation frequencies compared to the control. Biochar alone increased grain yield only at high rates of 10 t ha^{-1} and only under low-frequency irrigation. However, in combination with fertilizer microdosing, biochar application had greater impact on yield: Even at lower application rates of 5 t ha^{-1}, biochar combined with fertiliser microdosing increased yields under flat tillage and under both irrigation frequencies compared to the control.

Thus, for higher yields, fertiliser microdosing combined with biochar can be recommended under either precipitation frequency. Furthermore, the crop position on the tied ridge needs to be considered carefully depending on the water supply situation to optimise water management.

Keywords: Biochar, fertiliser microdosing, maize, rainwater harvesting, tied ridge

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