

Abstract

In semiarid Kenya, field productivity of maize has been at a low integrity level due to insufficient use of rainwater. From 2012 to 2013, an innovative ridge-furrow mulching system (RFMs) was tested using local maize (*Zea mays* L.) hybrid, *KCB* in KARI-Katumani Farm, Kenya in long and short rainy seasons. Field experiments were conducted in a randomized complete block design with four treatments: 1) RFMs with transparent polyethylene film (RFT), 2) RFMs with black polyethylene film (RFB), 3) RFMs with grass straw mulching (RFS), and 4) RFMs without mulching (CK). Soil moisture & temperature, grain yield, water use and economic benefit were determined and analyzed. The results indicated that both RFT and RFB treatments significantly increased soil water storage amount in the depth of 0–60 cm. Grain yield and water use efficiency (WUE) in both treatments were increased by 66.5–349.9% and 72.9–382% respectively, compared with those of CK over two growing seasons. In addition, grain yield and WUE in RFS treatment were only increased by 4.2–127.1% compared with those of CK. Particularly, two types of plastic films displayed different effects on modifying topsoil temperature. Transparent film mulching significantly increased topsoil temperature by 1.3 °C ($p < 0.05$) higher than CK, to facilitate growth and grain formation in long (but cool) growing season. In contrast, black film mulching lowered soil temperature by 0.3 °C lower than CK in short (but warm) growing season, which led to better soil thermal balance. Overall, RFMs with film mulching could serve as an effective solution to increase maize productivity, and hence a promising strategy to cope with food security under climate change in semiarid Kenya.