

ABSTRACT

Fruit rot disease in coffee caused by *Colletotrichum* sp. is one of the major constraints in coffee cultivation as it reduces both the quality and quantity of yields. Continuous use of synthetic fungicides has negative impacts on the environment and human health. Therefore, this study aimed to evaluate the effectiveness of several *Trichoderma* spp. isolates as biological control agents in inhibiting the growth of *Colletotrichum* sp. in vitro. The *Trichoderma* spp. isolates were obtained from the rhizosphere soil of coffee plant roots in two highland areas of Gayo, namely Ratawali and Tawardi villages. Antagonistic assays were conducted using the dual culture method on PDA media with 13 isolates and 3 replications. The results showed that all *Trichoderma* spp. isolates were capable of inhibiting *Colletotrichum* sp. growth in vitro, with varying levels of inhibition. The G2DTLD isolate exhibited the highest inhibition rate at (84,31%) on the 7th day, followed by G3DRLD (81,20%) and G3DTLD (80,83%). The observed mechanisms of inhibition included competition for space and nutrients, mycoparasitism, and antibiosis. These findings indicate that *Trichoderma* spp. have strong potential as effective and environmentally friendly biological control agents against coffee fruit rot disease.

Keywords: Antagonisme, biological control, *Colletotrichum* sp., coffee, *Trichoderma* spp.,