ABSTRACT

Sugarcane smut disease caused by a fungus *Sporisorium scitamineum* is a limiting factor to cane production in Kenya. It is threatening the sugar industry due to its effect on cane quality and yields. Sugarcane (*Saccharum officinarum* L.) is known to have microbial organisms associated with its rhizosphere with potential antagonistic activity against the fungus, however numerous studies on rhizosphere microbial diversity and their antagonistic activity against fungal plant pathogens have focused on other crops such as rice and wheat with little information available on sugarcane globally and underexplored in Kenya. The objectives of this study were to enumerate fungi and bacteria in the rhizosphere of CO 421 sugarcane variety, to identify the fungi and bacteria and to evaluate the antagonistic potential of selected microbial isolates against the pathogen within Kibos, an area of high percentage smut prevalence and a close vicinity to the Kenya Agricultural and Livestock Research Organization – Sugar Research Institute in Kisumu, Kenya. Variety CO 421 was selected because it is widely adapted and grown in all sugarcane growing areas of Kenya and has breaking resistance to smut. Rhizosphere soil samples were collected randomly from five different locations per field in ten fields of the sugarcane variety using a soil auger and trowel into sterile polythene bags. Colonies isolated from the soil samples in three replicates, following serial dilution and plating techniques on potato dextrose agar for fungi and nutrient agar medium for bacteria were enumerated and the microbes identified based on their morphological characters by using taxonomic guides and standard procedures. Screening for evaluation of potential antagonism against the test organism was done *in vitro* by dual culture technique in three replicates. *In vivo* screening was done in five treatments and five replicates by growing single budded sugarcane setts treated with the test organism and selected potential antagonists in plastic pots with steam sterilized soil in green house and in the field in micro plots. Setts were treated with four antagonists and distilled water as control. The experimental design was a completely randomized design. Data was collected on colony forming units per soil sample, colony and cell morphological characteristics, inhibition of mycelia growth of the test pathogen and the number of smut whips per treatment from November 2013 to November 2014. Data on microbial count, inhibition and disease incidence were subjected to analysis of variance. Treatment means were separated and compared using Fishers Least Significance Difference at p=0.05. The study indicated an average population of 1.30×10^7 cfu/g and 4.88×10^4 cfu/g bacteria and fungi respectively in the rhizosphere soil samples. Bacteria had a higher population and rhizosphere effect than Fungi. *Aspergillus, Penicillium, Trichoderma, Rhizopus* and *Alternaria* genera of Fungi and *Bacillus, Pseudomonas* and *Azobacter* genera of bacteria were identified. The four selected potential antagonists of *Trichoderma viride* and *Trichoderma herzanium* inhibited pathogen growth by 61% and 59% *in vitro* and showed 20% and 27% disease incidence *in vivo* respectively while AJB9 (unidentified) and *Pseudomonas* sp. showed inhibition zones of 25.6mm and 24.3mm *in vitro* and 13% and 17% disease incidence *in vivo* respectively. The selected isolates had evident antagonistic activity against the pathogen *in vitro* hence recommended as potential biocontrol agents of *Sporisorium scitamineum* which affects sugarcane plants.