ISOLATION AND CHARACTERIZATION OF ACTINOBACTERIA WITH POTENTIAL FOR CONTROL OF *FUSARIUM SPP* AND *COLLETOTRICHUM KAHAWAE*

JAMES OLUOCH NONOH

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Abstract

Smallholder subsistence farming is important in the production of food crops for basic livelihoods and income generation in rural areas. However, yields have remained low due to high disease, weed and pest incidences. Currently, crop pests and diseases are largely controlled by use of chemicals, which have adverse effects on the environment and nontarget organisms. There is need for new methods that are environmentally safe to supplement existing control strategies in order to enhance pest and disease control.

Microorganisms and their natural products are potentially important alternatives.

Identification and characterization of such microorganisms is critical in creating biological control alternative strategies.

In the present study, actinobacteria isolated from soil collected from selected protected areas in Kenya (National Parks and Reserves) were screened for antagonistic activity on three prevalent plant fungal pathogens. A total of four hundred and twenty eight (428) isolates were screened for antifungal activity on the three test fungi, *Fusarium oxysporum*, *Fusarium spp* and *Colletotrichum kahawae*. Three hundred and seventy nine (379) isolates did not show any observable antagonistic effects on the three test fungi *in vitro*. Twenty (20) isolates showed very minor antagonism in most of the fungi tested with the activity disappearing within a week. Eighteen (18) isolates showed *in vitro* activity on only one or two of the test fungi. Eleven isolates showed broad-spectrum activity on the three test fungi and were therefore studied further. The isolates that were not antagonists (379), those that showed inhibition on only one or two of the test fungi (18) and those isolates with minor inhibition whose activity disappeared with time (20), were not investigated further. The eleven isolates that were studied further and

characterized were selected based on *in vitro* broad-spectrum antifungal activity on all the three test fungi. They were isolated from different National Parks with Chyulu having the majority (6 isolates) while Ruma, Kakamega, Imenti, Aberdares and Shimba Hills National Parks produced one each. The isolates were characterized using morphological, biochemical and molecular methods. Phylogenetic analysis of amplified 16S rDNA sequence revealed that the eleven isolates belonged to the genus *Streptomyces*.

Majority clustered with known *Streptomyces* species. This was supported with physiological, cultural and morphological studies that demonstrated that the isolates displayed characteristics typical of streptomycetes. Three isolates out of the eleven showed very strong *in vitro* antagonistic effects than the rest indicating that the three are likely to produce novel antifungal secondary metabolites which can find useful application in biological control of crop diseases caused by fungi.