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In vitro screening of sorghum rhizobacteria for antagonism against selected sorghum foliar phytopathogens and their potential use in biocontrol

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Introduction

Sorghum (*Sorghum bicolor* (L.) Moench) is an African native drought resistant wild plant. It is particularly adapted to agro-ecological zones of Kenya which are arid and semi-arid and performs well on a range of poor soils often out-yielding most cereals in hot and dry environments. The crop therefore, alongside millets, serves as an important food security crop in Kenya. The production of sorghum has significantly been threatened by diseases (especially anthracnose) and insect pests. Conventional disease control has over time raised serious environmental concerns and is unaffordable to most of the farmers growing the crop. Biocontrol using Biological Control Agents (BCA) offers an alternative/supplemental way of reducing the use of chemicals. BCA development from sorghum rhizobacteria to control sorghum diseases will herald novel methods of protecting one of the staple foods in Kenya.

OBJECTIVE

To screen sorghum rhizobacteria for antagonism against selected sorghum foliar fungal phytopathogens of agricultural importance isolated from the Western Kenya region .

Materials and Methods

METHODOLOGY

Rhizobacteria were isolated from soil collected from sorghum growing areas and screened for antagonism against sorghum foliar phytopathogens viz: *Colletotrichum sublineolum* (anthracnose), *Exserohilum turcicum* (leaf blight), *Acremonium strictum* syn. *Cephalosporium acremonium* (black bundle disease), *Fusarium moniliforme* (head blight/stem rot), *Nigrospora oryzae* (ear rot) and *Botrytis cinerea* (grey mould).

STUDY AREA

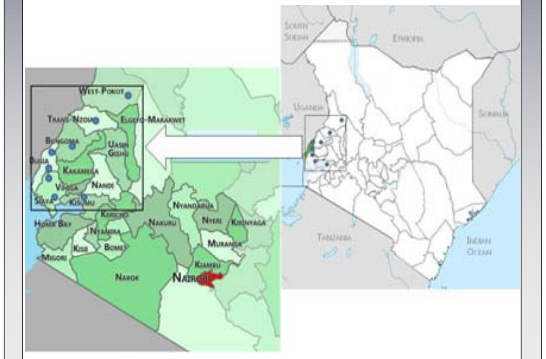

Figure 1: Map of Kenya showing counties studied.

Results

Out of the over 250 sorghum rhizobacterial isolates from different agro-ecological zones in Kenya that were screened, 90 exhibited different degrees of growth inhibition of the fungal phytopathogens expressed as % reduction in colony size.

Five rhizobacterial isolates produced growth inhibition ≥ 50% (Table 1). A Gram positive isolate whose identification is pending labeled strain SgI31 demonstrated antagonism to all the six with over 70% growth inhibition of the phytopathogens grown on a culture medium.

Rhizobacterial Isolate	Phytopathogen	Mean reduction in colony size, % (SD)
UrI15	*Colletotrichum sublineolum*	65.98
	Exserohilum turcicum	53.33
	Acremonium strictum	55.16
	Fusarium moniliforme	44.5
	Nigrospora oryzae	56
	Botrytis cinerea	52.89
SgI31	*Colletotrichum sublineolum*	93.73
	Exserohilum turcicum	88.33
	Acremonium strictum	89.67
	Fusarium moniliforme	86.55
	Nigrospora oryzae	76.56
	Botrytis cinerea	71.23
BrI131	*Colletotrichum sublineolum*	83.28
	Exserohilum turcicum	74.56
	Acremonium strictum	77.77
	Fusarium moniliforme	46.61
	Nigrospora oryzae	75.12
	Botrytis cinerea	65.34
AkI165	*Colletotrichum sublineolum*	93.95
	Exserohilum turcicum	81.61
	Acremonium strictum	95.56
	Fusarium moniliforme	44.5
	Nigrospora oryzae	76
	Botrytis cinerea	72.89
AkI167	*Colletotrichum sublineolum*	63
	Exserohilum turcicum	53.33
	Acremonium strictum	52.5
	Fusarium moniliforme	59.84
	Nigrospora oryzae	72.54
	Botrytis cinerea	69.89

Table 1: Screening of Rhizobacterial isolates against sorghum fungal plant pathogens.

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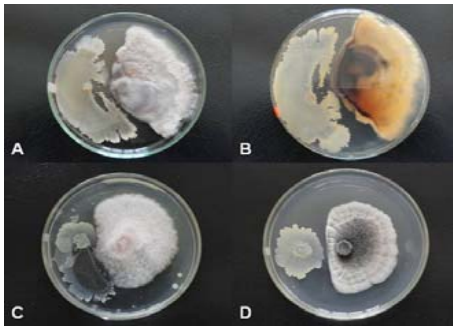

Plate 1. Inhibitory growth effects of sorghum rhizobacterial isolate SgI31 on: A—B; *Colletotrichum sublineolum* , C; *Fusarium moniliforme* and D; *Acremonium strictum* 11 days after inoculation.

Conclusion

These results suggest that metabolites from isolate SgI31 have a considerable wide spectrum of antibiotic activities with potential for use as biocontrol agents for fungal diseases of agricultural importance. This is an ideal finding which will enable the study to formulate a biological control agent that targets a wide range of sorghum phytopathogens thereby minimizing the use of chemical control agents in the management of sorghum fungal diseases.

Acknowledgement

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