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Anti-Oomycete Activity of some Fungal Root Endophytes in the Potato-*Phytophthora infestans* System

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Abstract

The oomycete *Phytophthora infestans* (Mont.) de Bary is the most important pathogen of potato in Kenya and requires an integrated approach for effective management. The use of endophytes in disease control has received gaining interest as they are resident potential antagonists, confer abiotic stress tolerance, and may promote plant growth. The antagonistic activity of 354 root-endophytic fungi isolated from four solanaceous species obtained from Kenya was screened *in vitro* against *P. infestans*. 60 isolates were selected and further evaluated in dual culture assays. The results revealed that mycelial growth of *P. infestans* was differentially affected by the tested endophytes. *Trichoderma harzianum* (positive control) along with two endophytes (KB1S2-4 and KA1S1-1) suppressed mycelial growth of the pathogen by 84.5 %, 78.2 %, and 76.5 %, respectively. Other endophytes (KB1S1-4, KB2S2-15, and KA2S1-42) showed their inhibitory activity in a different way. 25 μ l of crude extracts from culture filtrates of KB2S2-15 and KA2S1-42 completely (100 %) inhibited sporangia germination while extracts from KB1S1-4 significantly decreased sporangia germination (>72 %) and elongation of germ tubes ($p > 0.0001$). *In vivo* assays on detached potato leaflets revealed that treatment with 25 μ l of crude extracts from KB1S1-4, or KA2S1-42, or 2.5 μ l of KB2S2-15 completely suppressed necrotic symptoms elicited by *P. infestans*. Additional *in vivo* investigations showed that isolates KB2S2-15 and KA2S1-42 significantly increased tuber yield and leaf dry weight of potato. By contrast, isolate KA2S1-42 had a negative influence on tuber yield, while other fungi tested showed no significant differences of growth parameters compared to the control. Confocal microscopy studies revealed extensive colonisation of potato roots by isolates KA2S1-42 and KB2S2-15. In addition, scanning electron microscopy studies showed that isolate KA2S1-42 colonized potato tissue intracellularly. Interestingly, the ribosomal gene sequences of endophytic fungi KB1S1-4, KB2S2-15 and KA2S1-42 showed no significant similarities to known fungal species in the NCBI database. Identification of these endophytes is still in progress.

Keywords: Antagonism, fungal endophytes, *Phytophthora infestans*