DETERMINING THE INOCULUM THRESHOLD OF STREPTOMYCES SPECIES IN SOIL THAT CAUSES COMMON SCAB OF POTATO

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INTRODUCTION
Common scab of potato (Solanum tuberosum L.) is a complex disease because of the potential involvement of several species of Streptomyces. A variety of symptoms such as shallow, raised, netted or deep-pitted lesions can develop depending on the species of Streptomyces and the prevailing environmental conditions (1).

Pathogenic strains of Streptomyces have been characterised by the ability to produce the toxin, thaxtomin (2). A diagnostic test for pathogenic Streptomyces spp. was developed based on the thaxtomin gene to enable the detection and quantification of pathogenic strains of Streptomyces in soil (3).

The aim of this research is to study the effect of soil inoculum level of Streptomyces scabies on the production of common scab symptoms on potato tubers. This information will be useful in determining the target range of detection required for a diagnostic test in soil.

MATERIALS AND METHODS
Inoculum Streptomyces scabies infested vermiculite was produced by seeding a 25L container with 2 kg of vermiculite and spores washed from 5 yeast malt extract plates incubated for 2 weeks. The infested vermiculite was incubated at 27°C for 4 weeks. Six levels of inoculum were prepared 0, 1, 5, 10, 20 40% w/v of infested vermiculite to field soil. The field soil was tested and found to be free of S. scabies DNA.

Plant material Tissue culture plantlets of cultivar Desiree were prepared on MS media for 3 weeks prior to planting into the glasshouse. Agar was removed from individual plantlets prior to planting in infested soil. Plants were watered daily and fertilized with nitrophoska 5 g/pot.

Disease assessment After 3 months tubers were harvested from pots and assessed for percentage incidence of common scab (CS incidence) and percentage area of tuber covered with disease (CS index).

DNA extraction and quantification Once tubers were harvested the field soil was air dried and 500 g was sent to SARDI Root Disease Testing Service for DNA extraction and quantification of pathogenic S. scabies DNA, using a TaqMan test for the thaxtomin gene (3). DNA levels from soil were compared to a Streptomyces DNA quantification standard to calculate a DNA level of pg thaxtomin DNA/g soil.

Statistical analysis The trial was laid out as a randomised design in blocks with 4 replicates. Analysis of variance was performed using Genstat V9 to determine significant differences.

RESULTS AND DISCUSSION
The amount of infested vermiculite added to the field soil had a significant (P<0.001) effect on the level of common scab symptoms on mature tubers. No disease symptoms were evident at inoculum levels 0, 1 and 5% (Figures 1 and 2).

This study provides new information on the development of common scab symptoms. The results show that relatively high levels of soil inoculum are required to cause high levels of disease. This information is important in determining the target range required for a diagnostic test in soil.

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REFERENCES