Selection and Evaluation of Micro-organisms for Biocontrol of *Phytophthora infestans* in Potato

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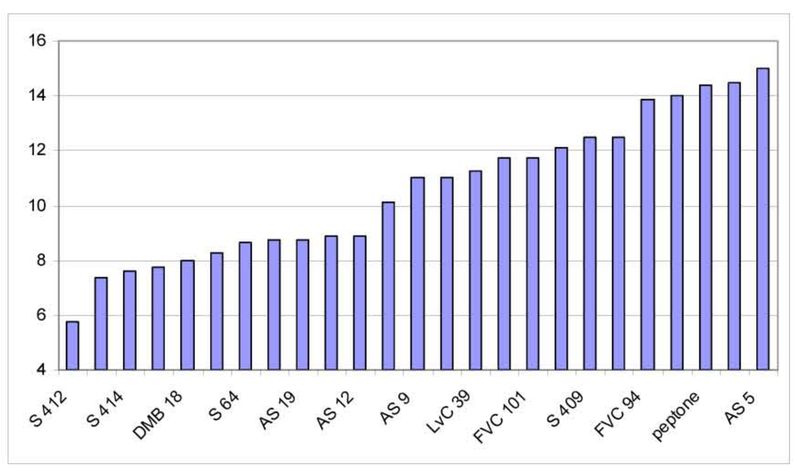
Introduction

In Sweden late blight disease is an important reason for a reduction of the acreage of organically grown potato. This is partly due to the fact that *Phytophthora infestans* is now also soil borne. It becomes necessary to control the pathogen both on the foliar parts and in the soil. Pathogen resistance, human health and environmental concerns have elevated the demand to find non-chemical alternatives that can supplement existing control strategies. Some plant beneficial micro-organisms possess the ability to effectively inhibit pathogens. Aim with this study was to investigate the effectiveness of a variety of natural bacterial and fungal antagonists to contribute to fungicide-free potato cultivation .

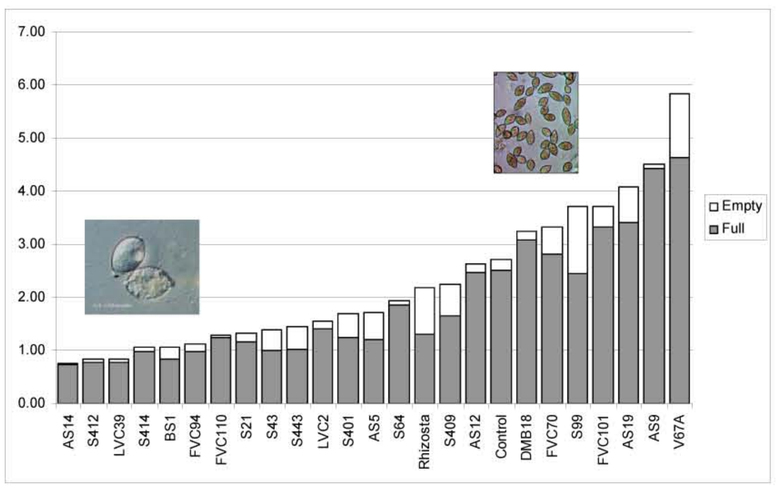
Materials and Methods

With the guiding hypothesis that the reduction of inoculum or disease producing activity of a pathogen is possible to accomplish by one or more organisms, we made prophylactic use of naturally existing plant beneficial micro-organisms of indigenous origin. The potential antagonists were subjected to multiple screening approach for tuber blight suppression and leaf blight reduction. Bioassays *in vitro*, in excised leaves and tuber slices of cultivar King Edward were thus used to screen the effect of >300 micro-organisms originating from different plant species and soils.
The isolates (fungi, actinomycetes, spore-forming and non-spore forming bacteria) showing suppression in all three bioassays were selected for their effect on *P. infestans* in two field trials.
Production of bacterial compounds of importance in antagonism were investigated *in vitro* with respect to hydrolytic enzymes, siderophores and hydrogen cyanide. These traits were considered while selecting organisms for field efficacy trial.

Results



Late blight in cultivar Matilda after treatment with 24 different micro-organisms suspended in 0,1% peptone solution. Y axis shows number of leaves with symptoms out of 25 leaves observed per plant (n= 8 plants). Controls treated with peptone.



Production of sporangia estimated on 100 leaves per treatment with 24 different micro-organisms (n=2). Controls treated as above.

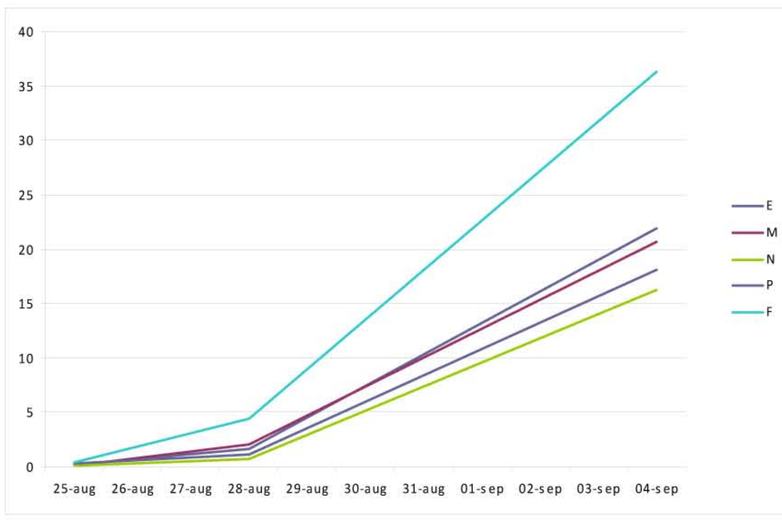
Conclusions

Some strains were found to be strongly antagonistic in the three different bioassays. Inhibition of mycelial growth, deformation of mycelium morphology and suppression of sporangia formation were the responses observed in *P. infestans* depending on the test organism indicating that various modes of action can be expected.

Application with bacteria on seed tubers and three foliar sprays caused significant delay in late blight disease development and suppression of sporangia production in field experiments. This delay was not long lasting.

Prophylactic application of the micro-organisms in field increased yield up to 26% by some bacteria.

Five bacterial strains belonging to the genus *Serratia* sp. were identified as best demonstrating the potential benefit of pre-screening candidate antagonists for further studies as part of an integrated late blight management program.



Late blight development in an outdoor experiment with four different micro-organisms compared to control (F) against late blight in cultivar Matilda. Randomized block design of the experiment (n= 3).

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