

Title: Selection of biocontrol agents antagonistic toward the ringrot bacterium

Project Leader: C. A. Ishimaru
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1998?
or 1989?

Project Justification:

Bacterial ringrot is an economically significant disease affecting seed and table stock production of potatoes in Colorado. It is widely accepted that economic losses due to bacterial ringrot would be much greater if it were not for the success of current certification programs aimed at production and commercial distribution of disease free seed. Unfortunately, availability and use of disease free seed can not eradicate the pathogen, Clavibacter sepedonicum, which is often present in the absence of disease symptoms. Thus, disease may occur from unidentifiable sources of inoculum in subsequent field generations. There are no chemical control measures for eliminating the pathogen on seed used in table stock production, or for preventing certified seed from becoming contaminated by any of several possible sources identified by recent research. Chemical disinfection of cutting and handling equipment and storage facilities help limit spread, but are inadequate methods for preventing recontamination by bacteria carried in irrigation water or on weeds. The potential use of biological control agents effective against bacterial ringrot has never been evaluated. Currently, methods for detecting and quantifying C. sepedonicum in the field are available or are being developed. These timely developments greatly enhance our understanding of the ecology and epidemiological of bacterial ringrot. Evaluation of the potential use of biocontrol agents to reduce recontamination of certified seed or to suppress bacterial ringrot in table stock production is now feasible.

Project Status:

This is a new project. However, I am developing a research program focused on bacterial ring rot of potato that extends previous studies conducted over the years by Dr. Monty Harrison. His ecological investigations have generated opportunities for research that can be addressed with current methods in biotechnology. For example, I have received funding for the development of gene cloning technologies to be used to identify conditions affecting expression and latency of bacterial ringrot symptoms. I have also been awarded funding to develop genetically marked strains of C. sepedonicum for use in epidemiological studies. Epidemiological studies have been hindered because of the lack of a selective medium for isolating the ringrot bacterium. Antibiotic resistance conferred to marked strains will enable isolation of the pathogen on antibiotic amended medium. Population sizes of these marked strains can then be quantified and related to the occurrence of disease. These studies, which are to be conducted in the field, greenhouse, and in potato plantlets grown in growth chambers, also provide a system for evaluating effects of biocontrol agents on C. sepedonicum. The population of the pathogen

can be quantified in the presence and absence of biocontrol agents. The unique contribution of my proposal to the SLVRCC is the selection and identification of bacterial strains effective as biocontrol agents for bacterial ringrot. Initial studies must focus on the antagonistic activity of biocontrol agents in plants grown under controlled environmental conditions in growth chambers and greenhouses, since field trials of a large number of potential biocontrol agents is impractical. After narrowing the number of potential biocontrol agents down, it will be possible to conduct experiments to measure effects of biocontrol agents on bacterial ringrot under field conditions.

Significant Accomplishments for 1898: Not applicable.

Objectives:

1. Isolate potential antagonistic bacteria from potato plant parts, plant debris, and soil collected from fields in the San Luis Valley with varied histories of potato cultivation. Several (100-500) different bacterial strains will be isolated and purified. The collection will be stored in glycerol at -80 C for future use.
2. Screen potential antagonistic bacteria for their ability to inhibit the growth of C. sepedonicum in culture. An in vitro bioassay will be used to detect antimicrobial compounds produced by the potential antagonistic bacteria which are effective against C. sepedonicum. These are standard procedures used routinely in my laboratory.
3. Screen potential antagonistic bacteria for their biocontrol activity in potato plantlets and eggplants inoculated with antibiotic resistant strains of C. sepedonicum and grown in growth chambers and greenhouses. Eggplant will be included as an indicator host in these experiments, because it readily expresses symptoms of bacterial ringrot. Disease occurrence and population size of the pathogen will be monitored, and effects of potential antagonistic bacteria determined by statistical analyses.

Funding Request:

1989 Allocation: -0-

1990 Request:	Technical support	7,000
	Supplies	3,000
	Travel	1,500

	Total	\$11,500