

Research Proposal For 2004

Submitted to:
SLV Research Center Committee
Colorado Potato Administrative Committee (Area II)

Title: *Using Biocontrol Crops to Enhance Potato Production*

Project Leader(s): Merlin A. Dillon, SLV Area Extension Agent, Agronomy, with technical expertise and advise from Dr. Russ Ingham, Associate Professor and Nematologist, Oregon State University, Corvallis, OR

Nature, Scope, and Objectives

Nematodes, especially Columbia Root-knot nematode (**CRKN**), are becoming an increasingly important pest of SLV potato production. CRKN can and has made entire potato fields unusable. A grower could loose his entire crop investment, about \$1400 per acre. For example, the grower might lose \$175,000 income from one center pivot. *Verticillium* has been a long-tem problem and can reduce yields through the early-dying complex.

Fumigant, applied preplant, or Vydate applied in-season are reasonably effective in controlling these pests. However, they are very destructive to beneficial organisms, to soil health and to grower quality of life. Growers love to grow potatoes but they hate it to have to use these harsh chemicals. Biocontrol cover crops trials have been shown to reduce the density of CRKN and *Verticillium* propagules in soil.

This will be the 5th year of funding for this project. Results of the 2002 and 2003 are now available. In 2003, nematode densities were dramatically reduced after winter rye incorporation. All covercrop treatments further reduced nematode densities greatly by August sampling. Columbia Root Knot nematode densities were reduced from 256 / 250 g soil in April winter rye to 130 in May to <4 in August. The trial is proposed to be repeated next summer to determine the reliability of the results.

OBJECTIVES FOR 2004:

1) To determine the benefit of cover crops on nematode (CRKN) and *Verticillium* propagule levels in the soil.

2) To compare the effect of growing sorghum-sudan for green manure vs. hay on the reduction of CRKN nematode and *Verticillium* level in the soil prior to the following potato crop.

Soil samples will be sent to Dr. Inghams' nematode lab at Oregon State

Relationship of the Proposed Project to Overall Problem

Cover crops are being used successfully in other areas to reduce nematode numbers. Examples of crops being grown are mustards, oil seed radish, sorghum-sudangrass, and rapeseed. The short growing season in the San Luis Valley may make implementing a cover crop challenging, but if successful has the potential to be a viable alternative to chemical control. We are particularly interested in screening crops that are cold tolerant and/or grow rapidly.

Green manure crops have shown great potential in reducing the impact of these pests.

However, many questions still remain as to how these crops grow in our environment and how to use them to our best advantage. Also, will these cover crops be reliable in reducing CRKN density or will this depend on the year?

Dedicating one entire crop year to a biocontrol cover crop is expensive (no crop income); however, growing a cover crop after barley increases yearly water consumption. The focus of this research has changed to growing a green manure crop as a cover crop using limited water. Growers are again being asked to reduce groundwater consumption by 20%. Growers should be able to grow a green manure cover crop with about 2/3 less water than barley. Growing a cover crop provides crop cover during growth and crop residue after incorporation. Therefore, it is feasible for growers to grow green manure cover crops and save groundwater, build soil organic matter and protect the soil from wind erosion at the same time. Fumigants and fungicides can be used to control these pests; however, these chemicals are harsh, very expensive; and soon may not be available. Preplant fumigant or Vydate applied in-season are very destructive to beneficial organisms, to soil health and to grower quality of life. We must be able to rely on some alternative pest control such as biocontrol crops to manage these destructive pests. Biocontrol crops show promise to control these pests

Method, Procedures and Facilities

A field trial will be established in a grower-cooperator field know to have infestation of CRKN. First, the field will be sampled on a 2-acre grid to determine where to locate the small plots. After results are back, small plots will be located and each plot sampled and treatments arranged to make starting levels as much the same as possible. Biocontrol cover crops will be planted with small plot planter in designated plots. Just prior to cover crop incorporation, nematodes will be sampled again. Then, the same plots should be sampled the following Spring just prior to potato planting.

Tractor, planter and tools will be needed from the SLV Research Center. Soil will be packaged and sent off to the lab at Oregon State University. No other facility needs are anticipated.

Potential for Leveraging Results for Outside Funding

This project could be funded by through USDA-SARE. That would require matching funds from the industry.

Timeline of Proposed Research and Short Term and Longer Term Outcomes

A field trial is proposed to be conducted this summer on a cooperators field. Nematode and *Verticillium* levels at cover crop incorporation could be available by next Fall. Final pest samples would be soil sampled at potato planting time and would not be available until results are analyzed and reported after that.

Several years of research detailing and documenting the advantages of using green manure cover crops will help to increase growers adaptation of this alternative method. Understanding the reliability of using these alternative methods will also determine their usefulness.

Detailed Annual Budget

2004 Request:

Soil Nematode Analysis	\$6,000
<i>Verticillium</i> Analysis	\$1,800
Shipping Samples	\$ 300
Part-time Labor	\$2,000
Demonstration Seed	\$ 200
Mileage	\$ 200
Supplies	<u>\$ 200</u>
TOTAL	10,700

Budget Justification

Nematode analysis at Oregon State University is \$25 each for research samples. This amount will allow for 240 samples. Likely I will analyze 60 samples at 4 different times (Preliminary, Planting, Incorporation and Potato Planting).

Verticillium analysis is \$15 each. \$1800 will allow for 120 samples. I plan to analyze 60 at cover crop planting and 60 at potato planting the following Spring.

Shipping charges are for sending soil samples to Corvallis, Oregon.

Labor is needed in soil sampling and planting. Labor may be needed to apply herbicide or insecticide on certain cover crops as required.

Demonstration seed is bought and provided to the cooperators to reimburse him for extra trouble, extra expenses and to insure better cooperation.

Mileage is necessary because the plots will be off-station, likely in Alamosa County.

Nematode samples must be mailed to Oregon.

Money for supplies are needed for soil bags, seed bags, etc.