

**2007 PROPOSAL FOR THE SLV RESEARCH CENTER COMMITTEE AND
THE COLORADO POTATO ADMINISTRATIVE COMMITTEE (AREA II)**

TITLE: Management of Nematodes on Potato in the San Luis Valley, Colorado

PROJECT LEADERS:

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NATURE, SCOPE AND OBJECTIVES OF PROPOSED RESEARCH

The Columbia root-knot nematode (*Meloidogyne chitwoodi*, CRKN) has become a threat to quality potato production in the San Luis Valley. In addition to the fresh market, which has low tolerance for tubers expressing symptoms of root-knot infection, the SLV also produces potato for seed and export markets, which have no tolerance for root-knot infection in tubers. Separate management strategies may need to be developed for crops destined for these different markets. Nematode management for fresh market may be based on fumigation with Telone, Vydate C-LV or, potentially green manure cover crops, perhaps in combination with Vydate C-LV. Various aspects of these different management strategies are addressed in this proposal. Corky ringspot (CRS) disease occurs sporadically in the SLV but can be a major production concern where it does occur. This research program will initiate reliable and economical approaches to control this virus disease that is vectored by stubby-root nematodes (*Paratrichodorus allius*).

OBJECTIVES

1. Determine the success of CRKN suppression by different rates of Telone II two years after application.
2. Determine the effect of various green manure cover crops on potato tuber damage caused by CRKN in a field with low CRKN densities.
3. Evaluate sudangrass cultivars for suppression of CRKN.
4. Evaluate the performance of Vydate for control of Corky Ringspot in the SLV.

JUSTIFICATION, METHODS, PROCEDURES AND FACILITIES (BY OBJECTIVE)

Objective 1. Telone II is the most effective nematicide registered for use on potato. However, at an estimate cost of \$11/gal plus \$45/acre for application, the labeled rate of 20 gpa costs \$265/acre which is considered to be expensive by SLV potato growers. While this expense is not as costly as the rejection if a potato crop due to excessive symptoms of infection by Columbia root-knot nematode (CRKN), Telone fumigation may be more economically attractive to SLV growers if costs could be reduced. Two ways to reduce cost are to reduce the rate of product applied and to try and get sufficient suppression for two potato crops with one Telone application. These procedures would be very risky in other, warmer growing regions where CRKN reproduce rapidly, but it may be appropriate for domestic fresh market crops in the SLV which has a shorter, cooler growing season and, thus, fewer generations of CRKN.

Two trials were initiated in fall of 2004 to examine the effects of Telone II at rates of 12, 15, and 20 gpa on CRKN. All three treatments provided excellent control of CRKN populations and almost no tuber infection was present in the 2005 potato crop in either trial. One of these fields was planted to barley in 2006 and the other was planted to sudangrass. Plots from both trials will be resampled at planting of potato in 2007 to determine if populations have remained suppressed to the extent that chemical control would not be required for the 2007 crop season. Plots in the field planted to sudangrass will be sampled again at harvest and tuber samples will be collected and examined for symptoms of CRKN infection at harvest and after incubation. This field also had plots that received no Telone in 2004. This grower plans to use Vydate in this field so the plots will be split with one half covered with a tarp during Vydate application (untreated) and the other half exposed and treated with Vydate. Thus, the following treatments will be evaluated.

2005	2006	2007
1. No Telone-Potato	Sudangrass	Potato-No Vydate
2. No Telone-Potato	Sudangrass	Potato-Vydate
3. 12 gpa Telone-Potato	Sudangrass	Potato-No Vydate
4. 12 gpa Telone-Potato	Sudangrass	Potato-Vydate
5. 15 gpa Telone-Potato	Sudangrass	Potato-No Vydate
6. 15 gpa Telone-Potato	Sudangrass	Potato-Vydate
7. 20 gpa Telone-Potato	Sudangrass	Potato-No Vydate
8. 20 gpa Telone-Potato	Sudangrass	Potato-Vydate

Objective 2. Two trials have been completed demonstrating that green manure crops can reduce high populations of CRKN and reduce tuber symptoms of CRKN sufficiently to provide acceptable tuber quality for domestic markets that have a low tolerance for CRKN. However, no information is available to determine if green manure crops can reduce low populations of CRKN sufficiently for this strategy to be effective for export markets that have zero tolerance for CRKN. During 2006, Merlin Dillon planted several green manure cover crops on June 13 in a field with low average population densities of CRKN. Each cover crop was replicated five times in a randomized block design and nematode samples were taken on June 12 and November 6. Effects of the cover crops on CRKN are illustrated in figure 1. This field will be planted to potato by the grower in 2007 and thus, provides an excellent opportunity to follow the effects of these cover crops on CRKN suppression through the potato crop, as well as examine the amount

of protection these cover crops may provide for suppression of tuber damage by CRKN. Soil will be sampled for nematodes at planting and at harvest of potato, and tubers will be evaluated for symptoms of CRKN infection at harvest and after an incubation period.

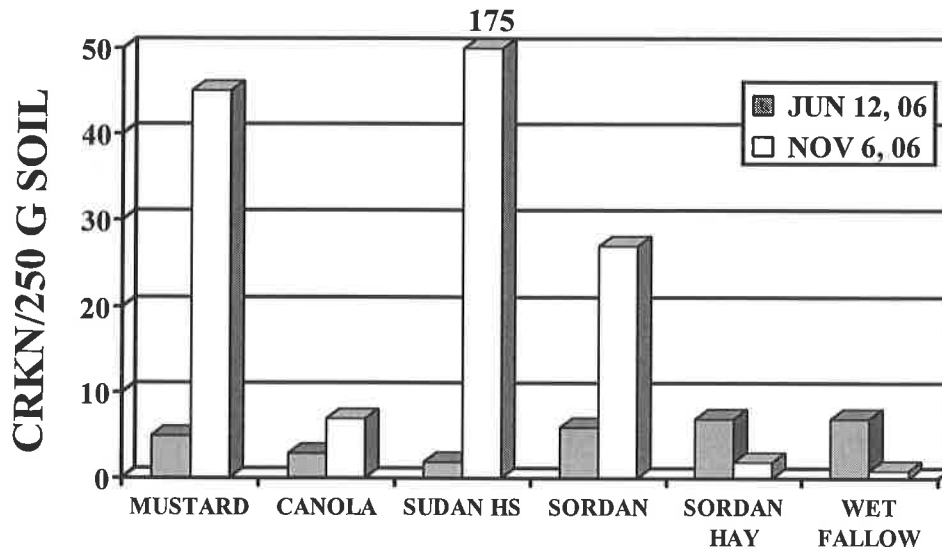


Figure 1. Effects of spring-planted cover crops on populations of Columbia root-knot nematode (*Meloidogyne chitwoodi*) in the San Luis Valley during 2005.

Objective 3. Trials have documented that sorghum-sudan cv Sordan 79 is effective at suppressing populations of CRKN in the SLV. Honey sweet, another sorghum-sudan hybrid available in the SLV, has not been as effective at suppressing CRKN populations. However, symptoms of CRKN in tubers grown after both cultivars were acceptable for domestic markets when tubers were evaluated at harvest. When tubers were incubated to reveal late season infection, damage was higher in tubers grown in Honey sweet plots than after Sordan 79. Variation in the suppressiveness of different cultivars of sudan and sorghum-sudan hybrids has also been observed in the Pacific Northwest. It is important to know the reaction of CRKN to different sudan or sorghum-sudan cultivars to determine if a variety exists that is more suppressive than Sordan 79 or if there are cultivars that may actually increase CRKN and thus should be avoided in potato rotations. Furthermore, cultivars that are equal or superior to Sordan 79 need to be identified should Sordan 79 be discontinued. Very little screening of sudan cultivars has been completed, however.

In this trial, six cultivars of sudan or sorghum-sudan hybrids will be planted in a randomized block design with five replications in a field which is known to be infested with CRKN and which will be planted to sudan by the grower. Test cultivars will likely include Sordan 79, Honey sweet Standard, Honey sweet II, Croplan Standard, Grazex II and piper, although grower input in this list would be appreciated. Samples for nematode analyses will be collected in the

spring before plots are planted and in the fall after incorporation. In 2008, funds will be requested to sample these plots at planting and harvest of the potato crop and to evaluate tuber infection. Evaluation of performance of these different varieties will provide information needed by growers to request specific cultivars when buying seed.

Objective 4. Corky ringspot (CRS) has been reported to occur after canola by growers in the SLV, suggesting that this crop is ineffective at controlling the stubby-root nematode vector. Vydate has been effective at controlling CRS in Oregon and Florida if applications are made early. However, this management strategy has not been tested in the SLV. A grower with a field history of CRS will follow canola with a potato cultivar sensitive to expressing symptoms of symptoms of CRS. The grower will treat the field with Vydate with an in-furrow application, a chemigated application 30 days after planting and a third application three weeks later. If the field also has CRKN, additional applications may be made. The grower will leave some rows untreated with the in-furrow application. Tarps will be placed over four-row wide by 25 ft long plots in this untreated area to establish untreated controls. Other plots in this area will receive all chemigated applications to test the effectiveness of a Vydate program without an in-furrow treatment. Thus, the three treatments to be tested will include:

1. Untreated Control
2. Chemigation applications at 30 and 51 days after planting
3. In-furrow plus chemigation applications at 30 and 51 days after planting

Each treatment will be replicated five times. Nematode samples will be taken at planting and at harvest. Tuber samples will be collected, sliced and scored for symptom expression of CRS. If CRKN is present in this field, tubers will be evaluated for CRKN symptoms as well.

RELATIONSHIP OF PROPOSED RESEARCH TO OVERALL PROBLEM

A considerable percentage of potato acreage in the western United States is infested with root-knot nematodes. Even minimal damage to tubers from root-knot nematodes can result in substantial decrease in crop value. Control measures utilized in other regions have been effective but are too expensive for the narrow profit margins from production in the SLV. Nematode management guidelines and treatment options must be developed specifically for the unique growing conditions in the San Luis Valley. Research in the SLV is complemented by biological and treatment schedule research in other production areas in an attempt to develop a comprehensive management plan for nematode control that can be applied to all production areas.

POTENTIAL OF PROPOSED RESEARCH RESULTS TO OBTAIN OTHER FUNDING

Dow and DuPont have contributed substantially to funding, labor and product for various objectives completed by this project in the past. Support from DuPont for 2007 is unknown at this time but DOW has expressed interest in contributing to another the Telone rate trial in fall of 2007 if a suitable site and cooperating grower can be located. Work on green manure crops in cooperation with Merlin Dillon and others contributed to the successful funding of a grant submitted to EPA in 2007. Results from this research project may also provide necessary data for preparation of a Western Region IPM proposal, which would provide funding for CRKN nematode research in the San Luis Valley.

TIMELINE AND OUTCOMES

All fieldwork associated with these trials will be completed by fall of 2007 except for the sudan variety trial which will continue through the potato year in 2008. We intend to establish another Telone II rate trial in fall of 2007 to collect supporting data to pursue a reduced rate label for the SLV. Funds for that trial, including work that will occur in 2007 will be requested from CPAC and Dow AgroSciences in our proposal for 2008.

Short-term outcomes will include recommendations of the most effective and/or economical use of Telone for CRKN control in the SLV. This project will also contribute to developing guidelines for using green manure crops, particularly sudan cultivars for CRKN suppression. This project also will provide the first information on control of CRS in the SLV with Vydate. Major milestones and accomplishments expected include better understanding of the relationship between Columbia root-knot nematode and potato, and the establishment of the most reliable and economical methods for SLV growers to protect potato crops from losses due to nematode damage.

FUNDING REQUEST:

2006 Allocation: \$15,000

2006 Request:

Nematode Processing of Soil and Tuber Samples	\$12,750
Travel	5,000
Labor	5,500
Shipping Samples to Oregon	3,200
Misc services and supplies	3,700
Total Cost of Project	\$30,150

Total CPAC Request **\$30,150**

**Note: If the objective on sudan cultivar trial is approved, Merlin Dillon will need \$500 for his effort in this objective.

This budget includes work for all the objectives as described. However, there is some flexibility in the budget by reducing the effort under some objectives and/or eliminating other objectives to meet the needed support for the research if this is necessary due to CPAC budget constraints. Priority ranking of objectives by the project leaders would be for objectives 1 and 2 since considerable effort and expense has been expended to establish these research opportunities and if they are not pursued at this time these opportunities will be lost.