

## RESEARCH PROPOSAL FOR 1993

Submitted to: San Luis Valley Research Center Committee  
and the Colorado Potato Administrative Committee (Area II)

**TITLE:** Influence of agronomic decisions on weed control and long-term soil-seed banks in potatoes.

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### PROJECT JUSTIFICATION:

Two separate studies are proposed. The first study is to establish a long-term experiment on weed control and changes in the soil-seed bank. The second study is designed to address an immediate need for control of volunteer canola in potatoes.

#### Study I:

Potato producers are in a yearly battle with weeds to produce a profitable crop. Weeds reduce yields through competition for light, water, and nutrients and interfere with other practices. However, heavy reliance upon herbicides for weed control raises issues of economics and environmental concerns. Research examining the long-term impact of weed levels which do not reduce yields but produce weed seed is lacking.

Potato variety selection, tillage to stimulate seedling emergence and control weeds, rotational crop selection, and weed control strategies within rotational crops all impact weed density and the soil-seed bank.

A strategy to reduce or eliminate soil-applied herbicides for potato production is to rely on effective cultural strategies to minimize weed impact on tuber yield. Competitive potato varieties with rapid growth that quickly shade the soil surface and mechanical control are two effective cultural measures for minimizing herbicide use. Reducing the soil-seed bank to a level that does not result in a competitive stand of weeds is another strategy to reduce soil-applied herbicides. Utilizing rotational crops to eliminate seed production of weeds difficult to control with potato herbicides is an approach to reduce weed seed production. Stimulating weed emergence by cultivation and then destroying the weeds with subsequent cultivation is another approach to reducing the seed bank. However, research examining the interaction of these factors to reduce the weed seed bank has not been studied.

Preliminary research conducted in 1992 shows that with mechanical control, weeds were present in the field, but did not impact yield, also the end-of-season weed seed counts were lower than at-planting counts. This suggests that with mechanical weed control the seed production of escaped weeds may be off-set by stimulating germination of weed seeds which do not subsequently produce seed.

Long-term benefits of this research include evaluation of mechanical versus chemical control for weeds and development of programs for reducing the level of weed seed bank in potato production. Also, less reliance upon herbicides will result in lower chemical costs and reduce the risk of environmental and water contamination.

#### Study II:

Number of acres planted to canola is increasing each year in the SLV. Canola pods readily shatter if the crop is swathed and threshed when the moisture is below optimum levels. The shattering of the pods has the potential for

volunteer canola in potatoes. There is no research reported on control of volunteer canola in potatoes.

**PROJECT STATUS:** New

**OBJECTIVES FOR 1993:**

I. Implement the first year of a multi-year study to examine weed control and the changes in the soil-seed bank resulting from the interaction of variety selection, potato weed control strategies, rotational crop selections, and weed control within the rotational crops.

II. Determine effective control of volunteer canola in potatoes.

**PROCEDURES:**

**Study I:**

In 1993, four treatments will be established. 'Centennial' and 'Norkotah' varieties will be used and each variety will be treated with Dual at drag-off or mechanical weed control. In 1994, overlaid on each treatment will be three rotational treatments. Rotational treatments will be barley, vegetable (to be determined later) with herbicide and the same vegetable with mechanical weed control. This rotation will be repeated for a minimum of two cycles (4 years).

Mechanical weed control in potatoes will consist of repeated passes of the hiller, as well as a flexible tined-implement across the top of the hills. In the vegetable crop, the flexible tined-implement will be used as well as multiple cultivator passes. These treatments are designed to control small weed seedlings as well as stimulate additional flushes of weed emergence. The rotational crops were chosen to provide different levels of weed control and differing stimuli for weed seed germination.

Soil samples will be taken immediately after planting in 1993, and post-harvest in 1993 and all subsequent years. Weed seeds will be extracted, identified, and counted. Weeds will be counted in each plot at layby and pre-harvest. Plots will be harvested and yield for each treatment recorded.

Eventually this data will be used to develop a model to explain the changes in the soil-seed bank and predict changes for a field based on agronomic practices.

**Study II:**

Potatoes will be planted and canola seeds spread evenly over the plots. Herbicide treatments will consist of Eptam or Eptam + Dual pre-plant incorporated; Dual, Sencor, or Dual + Sencor either preemergence or at drag-off; as well as an untreated check.

Control ratings will be taken 14 and 28 days after emergence and prior to harvest.

**FUNDING REQUEST:**

In order to obtain useful information from soil-seed bank data, multiple cropping years are required. We are asking for funding from SLVRCC to establish our plots and gather base-line data. With preliminary results of 1-2 years, we will be looking for funding from other sources to continue this research.

EXPENSES	AMOUNT REQUESTED
Salary (Post Doctorate - 2 mos)	5,000
Hourly labor	2,000
Supplies	500
Travel (5 trips)	1,000
TOTAL	8,500