SUMMARY RESEARCH PROGRESS REPORT FOR 1989 AND RESEARCH PROPOSAL FOR 1990
SUBMITTED TO SLV RESEARCH CENTER COMMITTEE AND AREA III
POTATO ADMINISTRATIVE COMMITTEE

TITLE: Foliar and Tuber Symptomatology of Potatoes Following Misapplication or Soil Carryover Effects of the Small Grain Herbicides **Assert** and **Harmony Extra** on Potatoes.

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PROJECT STATUS: This report covers aspects of potato-herbicide research begun in 1988, and requests 1989 funding for a new phase of research.

SIGNIFICANT ACCOMPLISHMENTS FOR 1989:
Four studies associated with herbicide damage to potatoes were conducted in 1989:

1. Greenhouse oust studies on Russet Burbank, Centennial Russet, and Norkotah potatoes with soil and water from the SLV.
2. Planting of oust, harmony extra, and assert damaged Russet Burbank and Centennial Russet tubers from the 1988 SLV study.
3. Replanting of barley, plus Russet Burbank and Centennial Russet potatoes into the 1988 SLV research plot area.
4. Effects of ultra low oust soil levels on Russet Burbank, Centennial Russet, Sangre, and Russet Norkotah potatoes.

Results: **Study 1.** Oust applied **preplant incorporated** (PPI) at 100 - 500 parts per trillion (ppt) in the soil reduced the number of Russet Burbank normal tubers, increased the number of abnormal tubers, and reduced tuber weight. Oust did not affect the number of shoots per pot, the plant height, nor shoot or root dry weight. Oust applied PPI did very little damage to Centennial Russet or Russet Norkotah potatoes, except for reduced tuber weight at 100 ppt. When oust at 10 - 100 ppt was banded around the seed piece, it had no major effects on all 3 potato varieties except to significantly increase the number of Russet Burbank abnormal tubers. Oust applied preemerge at 300 ppt to the soil surface significantly decreased the number of Russet Burbank normal tubers per pot, and significantly decreased tuber weight for Russet Burbank and Russet Norkotah potatoes. Depending on the study, detectable potato damage, especially with Russet Burbank, was obvious beginning at 100 ppt (= 0.1 part per billion ppb). In some pots damage was obvious at 10 and 20 ppt, but this was not consistent across replications.

Study 2. When 1988 tubers from the oust, harmony extra, and assert treated plots were planted in 1989, the oust at 4 ppb treatment caused a significant reduction in the number of shoots per 10 plants, but did not affect tuber germination. Oust at 4 ppb tubers produced significantly fewer tubers, and less tuber weight. All of the herbicide treated tubers produced more abnormal tubers than the untreated check plot tubers. However, the vast majority of 1989 tubers were normal and of a marketable quality.

Study 3: When barley was planted back into a portion of each 1988 research plot, oust caused visible barley injury (11 - 40%) early in the season, but this did not translate into yield reduction. Slightly more potato damage occurred on early treated 1988 plots vs. late treated plots, perhaps because early treated plots had more bare soil exposed; the early 1988 application of oust reduced the number and weight of Russet Burbank potatoes. The other herbicides, when applied at low rates in 1988, did not cause significant carryover damage to Russet Burbank or Centennial Russet potatoes.

Study 4: When oust was applied at 2.5 - 500 ppt PPI in the SLV in a 1989 field experiment, the 200 and 500 ppt rates caused a significant reduction in the number and weight of potato tubers, while simultaneously increasing

the number of abnormal tubers. Rates below this tended to produce little or no potato tuber damage. Russet Burbank yielded the most tubers per plot (but was also the variety most easily damaged by oust), followed by Sangre, then Russet Norkotah, and finally Centennial Russet. Improved redroot pigweed control was also obvious in plots with 200 and 500 ppt of oust.
In Summary, this research has shown that oust has moderate to high carryover potential in SLV soils (as measured by its biological activity on potatoes, particularly the Russet Burbank variety). Carryover injury from oust becomes most obvious and most consistent at 100 - 200 ppt (= 0.1 - 0.2 ppb). Russet Burbank is the potato variety most sensitive to oust presence in the soil. Barley was unaffected by herbicide soil carryover. Finally, every herbicide user in the SLV must realize that herbicides with very high biological activity need to be used with extreme caution in the valley.

OBJECTIVES FOR 1990:
1. Evaluate the injury symptomatology and yield response of 4 potato cultivars treated with low rates of **Assert** and **Harmony Extra.**
2. Evaluate the soil carry-over effect of **Assert** and **Harmony Extra** on 4 potato cultivars planted back into soil treated with these herbicides.
3. Produce a concise educational document, with pictures, to help identify and assess potato injury caused by **Assert** and **Harmony Extra.**

RESEARCH PLAN
Study 1: Russet Burbank, Sangre, Centennial Russet, and Russet Norkotah potatoes will be planted in a large study area in the San Luis Valley (elevation 7,500', soil pH = 8, soil temperature 62 F). Treatments will be applied to 10 X 25' plots arranged in a split plot arrangement of a randomized complete block design with 3 replications. A special, precision, low herbicide rate boom (designed for ultra low rate herbicide research) will be used with the hand release valve installed at the lateral boom connector to insure accuracy of application (+ or - 1.5% of intended spray rate). Harmony Extra at 0.375 and .185 oz ai/a, and Assert at .47 and .235 lb ai/a will be applied over the top of growing potatoes at the pre-bloom, and at the post-bloom stage. Injury symptoms such as floral abortion, foliage deformities, changes in foliar color, tuber cracking, tuber folding, and other tuber damage will be evaluated. Total yield, and percent marketable tubers will be evaluated. A full color photographic and video record of this information will be taken.

Study 2: Harmony Extra at .42 and .23 oz ai/a and Assert at .46 and .36 lb ai/a will be applied to 20 X 20' barley plots in the spring of 1990 in the San Luis Valley. Experimental design will be a randomized complete block with 3 replications. Soil samples will be taken at 0, 2, 4, 8, 16, 32, and 52 weeks after application for a lentil root bioassay analysis, and HPLC quantification if feasible. The year after application, Russet Burbank, Sangre, Centennial Russet, and Russet Norkotah potatoes will be planted into the entire plot area. An untreated check will serve as the reference for evaluation of abnormal foliar symptoms, and possible tuber damage including cracked, folded, knobby, or minuscule tubers. Total yield and percent marketable tubers will be evaluated. A full color photographic and video record of this information will be taken.

Proposed 1990 Budget

Hourly labor	**5000**
Travel	**1000**
Supplies	**500**
Total	**$ 6500**

A full report will be submitted at project termination.