

SUMMARY RESEARCH PROGRESS REPORT FOR 1989

SUBMITTED TO SLV RESEARCH CENTER COMMITTEE AND AREA III
POTATO ADMINISTRATIVE COMMITTEE

SUBMITTED BY Philip Westra, 112 Weed Science Lab, CSU
Ft. Collins, CO 80523 303-491-5219

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 premerge 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.

1989 SAN LUIS VALLEY POTATO RESEARCH

1989 Seltzer's corner plantback of selected tubers from 1988 study.

PROCEDURES: Potato stock for planting was obtained from the 1988 study in the San Luis Valley in which six sulfonyleurea herbicides (oust, glean, harmony extra, amber, ally, and assert) were applied to the foliage of russet burbank and centennial russet potatoes. All of these herbicides caused malformation in developing tubers and the tubers harvested from oust, harmony extra, and assert treated plots were used as seed stock for plantback in 1989.

PLOT SIZE: Plots were ten feet in length and two rows wide (34 inch row spacing) and each plot was replicated three times. Potatoes were planted on 6/2/89 and harvested on 9/16/89.

1989 Ultra-low oust soil incorporation study in the SLV.

PROCEDURES: Certified potato seed stock was obtained from the C.S.U. research station in the San Luis Valley. Russet burbank, centennial russet, sangre, and norkotah russet potato varieties were used for this study. Soil was prepared prior to herbicide treatment by rototilling to a depth of eight inches. Analytical grade oust was applied to plots at rates varying from 2.5 ppt to 500 ppt and incorporated to a depth of eight inches with a rototiller. Before planting, granular herbicide was broadcast applied according to standard recommendations for the area. Potatoes were hand planted and irrigation drip lines were installed immediately after planting.

PLOT SIZE: Plots were ten feet long by four rows wide with a 34 inch row spacing and each treatment was replicated three times. Potatoes were planted on 5/26/89, received a visual evaluation on 8/10/89 and were harvested on 9/13/89.

1989 plantback of potatoes and barley into 1988 herbicide contamination site.

PROCEDURES: Certified potato seed stock was obtained from the C.S.U. research station in the San Luis Valley. Russet burbank and centennial russet potatoes were used for this study. Prior to planting soil was rototilled to a depth of eight inches. Potatoes were planted into a 1988 study area in which potato foliage had been treated with oust, glean, amber, ally, harmny extra, and assert. This study was designed to observe possible residual effects of planting potatoes and barley into soil which had been contaminated the previous year with these herbicides.

PLOT SIZE: Plots for the 1989 study were placed directly on top of the study area used for the 1988 study. Plot were fourteen feet long and two rows wide with a 34 inch spacing. Three feet on either end of each plot were planted to barley and the middle eight feet of each plot were planted to potatoes. Each plot was replicated three times. Tubers were hand planted on 5/11/89, received a visual evaluation on 8/10/89 and were harvested on 9/14/89.

1989 GREENHOUSE STUDIES

Ultra-low oust soil incorporation.

PROCEDURES: Research was initiated in December 1988 to determine the effects of ultra-low oust levels in soil on tuber development in russet burbank and centennial russet potatoes. Uncontaminated soil and water from the San Luis Valley and certified seed stock from the C.S.U. research station in the San Luis Valley were used for this study. Oust was soil incorporated using a cement mixer which was rinsed with bleach and copious quantities of water between each treatment. Each seed piece was planted at a depth of two inches in a twelve inch pot on 12/23/89. Each pot held approximately 12 kg soil. Fertilizer was added at the time of herbicide incorporation and nitrogen was added at 20 lb/a at two week intervals once the plants had emerged. Tensiometers were installed at planting in one replication of each treatment in order to maintain adequate watering. Due to poor emergence potatoes were replanted on 2/28/89 in affected pots. The first crop was harvested on 4/4/89 and the second crop was harvested on 6/6/89. Approximately three weeks before harvest of the second crop we ran out of San Luis Valley water and used Fort Collins water instead.

Banded oust experiment.

PROCEDURES: This study used the same methodology as part 1 but in this study the oust contaminated portion of the soil was a four inch band of soil located two inches below the soil surface. The seed piece was planted into the contaminated band.

Surface applied oust.

PROCEDURES: This study used the same methodology as the others except that for this study there was no need for the cement mixer since the herbicide was surface applied to each pot after planting.