

FINAL RESEARCH REPORT ON 1988  
POTATO-HERBICIDE INJURY STUDY  
FEB. 21, 1989

CONDUCTED BY CSU WEED SCIENCE PROGRAM  
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Confirmed cases of OUST herbicide injury to potatoes in 1987 in the San Luis Valley prompted this research which was designed to document foliar and tuber injury caused by foliar applications of oust, harmony extra, assert, amber, glean, and ally herbicides. Oust was the only non-crop land herbicide used in this study. Harmony extra and assert were included because of their barley marketing potential in the valley; this research simulated drift or misapplication of these two products. Glean and amber were included to broaden our understanding of sulfonyleurea herbicide effects on potatoes. Russett burbank and centennial russett potatoes were evaluated in this study because of their market dominance and importance in the valley. All herbicides were applied July 1 during tuber initiation to one set of plots, and on July 14 during tuber bulking to a second set of plots. The study had three replications. \*\* It is important to note that harmony extra at the high rate was used at 75% of a full field label rate, and assert was used at the high field label rate in this study.

INJURY RATINGS 2 WEEKS AFTER THE JULY 1 APPLICATION DATE.

The high rate of oust and harmony extra, plus amber and assert caused a significant increase in visual injury symptoms as well as chlorosis in both potato varieties. The high rate of oust and harmony extra significantly reduced potato plant height for both varieties. Additionally, amber and assert significantly reduced potato plant height for the centennial russett variety. By 2 weeks after application, foliar effects could be observed and measured for oust, harmony extra, amber, and assert. Glean and ally produced no significant effects on either variety.

INJURY RATINGS TAKEN ON JULY 22, 1988.

**FLOWER NUMBER.** Virtually all of the herbicides significantly reduced flower numbers at both times of application, although the reduction was more severe for the July 1 application than for the July 14 application. Flower number reduction was very striking in the field, averaging 37% reduction for russett burbank, and 47% reduction for centennial russett across the entire study.

**CANOPY CROSS SECTION.** Significant differences in potato canopy height and row closure were obvious. By measuring the height and width of the canopy, a canopy cross section could be calculated. All of the herbicides except ally and glean at the

low rate caused significant reductions in canopy cross section. Oust at the .141 oz ai/A caused the most reduction. Canopy reduction from the July 1 application was more severe than from the July 14 application. Russett burbank cross section was reduced 24% and centennial russett cross section reduced 29% averaged across all herbicides.

**PLANT CHLOROSIS AND STEM DISCOLORATION.** Neither of these variables was evaluated because the degree of damage was minimal or inconsistent across replications. In general, oust, assert, and the high rate of harmony extra caused detectable, slight chlorosis, on the order of 10 - 15% lighter colored leaves. Foliage color following application of all other herbicides was normal, or very nearly normal. None of the herbicides, at the rates tested, caused obvious yellowing or highly chlorotic foliage. Although purple stem discoloration was noted in some plots, the degree of discoloration was inconsistent and did not warrant detailed evaluation.

A striking foliar symptom noted in all oust treated plots, particularly at the higher rate, was a foliar symptom which looked like drought stress or some sort of viral or psyllid injury. This is apparent in detailed photographs taken on July 22. The effect was consistent across replications, and was quite severe for the high rate of oust. Dr. Gary Franc first thought that we had psyllid injury in certain plots, which turned out to be the oust treated plots. This reinforces the conclusion that of all the herbicides tested, oust caused the most noticeable and striking changes in potato foliar characteristics. On July 22, photographs were taken of both potato varieties for all treatments in this study.

#### HARVEST DATA FROM SEPTEMBER 22, 1988.

Although a preliminary harvest of 3 plants from the leading edge of each plot was conducted on 8-18-88, and the data is present in the complete data package, the data interpretation presented here will be from the final harvest on 9-22-88 which consisted of an average of 9 plants per plot. In general, the conclusions to be drawn from the 8-18-88 harvest very closely parallel the conclusions from the final harvest.

#### **POTATO YIELD.**

RUSSETT BURBANK. Oust at both rates applied July 1 and July 14, and harmony extra at the low rate applied July 14 significantly reduced yields. Oust at the high rate applied July 1 reduced yield by 48%.

#### CENTENNIAL RUSSETT.

**JULY 1 APPLICATION.** All herbicides applied, except ally,

significantly reduced yields. Oust at the high rate reduced yield by 49%.

**JULY 14 APPLICATION.** Oust, amber, and assert significantly reduced yields. Greatest yield reduction was 32% for oust applied at the low rate.

#### TUBER NUMBERS.

For the russett burbank variety, the July 1 application of both rates of oust caused a significant increase in tuber number; tuber number was increased 217% following application of the high rate of oust. It was visually striking during harvest to see the proliferation of small tubers caused by the July 1 application of oust; this is evident in tuber photographs from the final harvest. July 14 applications of oust did not cause a significant increase in tuber number. For the centennial russett variety, oust at the high rate applied July 1 and July 14 caused a significant increase in tuber number. No significant change in tuber number was observed for any other herbicide.

#### AVERAGE TUBER WEIGHT.

**RUSSETT BURBANK.** Oust, harmony extra, and amber applied July 1, as well as oust and harmony extra at the high rate applied July 14 significantly reduced average tuber weight. Oust at the high rate applied July 1 reduced average tuber weight by 84%.

**CENTENNIAL RUSSETT.** Oust and assert applied July 1, and oust, harmony extra, amber, and assert applied July 14 significantly reduced average tuber weight. Centennial russett average tuber weight was more sensitive to assert than was russett burbank average tuber weight. Oust at the high rate applied July 1 reduced average tuber weight by 71%.

#### TUBER QUALITY AT FINAL HARVEST.

**RUSSETT BURBANK-Normal tubers.** Oust, harmony extra, and amber applied July 1 as well as oust, harmony extra, amber, ally, assert, and glean at the high rate significantly reduced the percentage of normal tubers harvested. All other treatments did not significantly lower the percentage of normal tubers harvested.

**Cracked tubers.** Assert and harmony extra applied July 1 and July 14, as well as oust and amber applied July 14 significantly increased the percentage of cracked, abnormal tubers harvested. Tuber cracking was not a predominant symptom from the July 1 application of oust.

**Folded tubers.** Oust applied July 1 and July 14 as well as harmony extra applied July 1 caused a significant increase in folded tubers which suggests that tuber growth and development was abnormal following application of these herbicides.

**Popcorn tubers.** Only oust and harmony extra at the high rate applied July 1 caused the formation of very abnormal popcorn tubers which were small in size and covered with numerous bumps and knobs.

**Knobby tubers.** Oust applied on July 1 and July 14 was the only herbicide to cause a significant increase in the percentage of medium sized tubers with large knobs and protrusions on the tuber surface.

**Minuscule tubers.** Oust applied July 1, and oust at the high rate applied July 14 caused a significant increase in the percentage of very small, minuscule tubers.

**CENTENNIAL RUSSETT-Normal tubers.** Oust, amber, assert, and harmony extra applied July 1 (only harmony extra at the high rate) and July 14 caused a significant reduction in the percentage of normal tubers harvested. Oust at the low rate applied July 14 reduced normal harvested tubers by 97%.

**Cracked tubers.** Oust and assert applied July 1 and July 14 as well as harmony extra and amber applied July 14 significantly increased the percentage of cracked, abnormal tubers harvested. Cracked tuber symptomology was most exaggerated for oust treatments.

**Folded tubers.** Oust at the low rate, harmony extra at the high rate, and assert applied July 1 significantly increased the percentage of abnormal, folded tubers harvested. No other treatments had significant effects on percentage of folded tubers harvested.

**Popcorn tubers and knobby tubers.** None of the herbicides caused any significant effects in these two classifications, indicating that this symptomology was not characteristic of centennial russett potato response to any of the herbicides tested.

**Minuscule tubers.** Harmony extra at the high rate applied July 1 caused a slight, but significant increase in the percentage of very small tubers harvested.

## SUMMARY CONCLUSIONS

1. In general, the July 1 application of herbicides during tuber initiation was more damaging to yield and tuber quality than the July 14 application during tuber bulking phase.
2. Oust damage symptomology to russett burbank tubers shifted dramatically from the July 1 application to the July 14 application. The early application caused folded, knobby, popcorn tuber symptomology with very few tuber cracks evident, and the proliferation of many small tubers. The late application symptomology was predominantly tuber cracking.
3. The order of increasing severity of injury to potatoes in this study was:  
  
UT. CHECK < ALLY < GLEAN < AMBER < HARMONY EXTRA < ASSERT < OUST
4. Tuber symptoms and tuber damage were more obvious and more severe than foliar symptoms or foliar damage following application of these herbicides.
5. In light of the perceived weakness of the sulfonylurea herbicides on plants in the Solanaceae or nightshade family, the severity of oust damage to potatoes (a member of the nightshade family) was somewhat surprising.
6. Oust, even at the lowest rate tested, was extremely damaging to potato tubers. Its level of tuber damage was several orders of magnitude greater than the other sulfonylurea herbicides tested. The effects of oust on tuber size and tuber quality virtually eliminated the production of any marketable tubers. Oust and growing potatoes are an extremely bad mix. This indicates that under no circumstances should oust be allowed to contaminate environments where potatoes are grown.
7. Assert, either drifting or at field label rates, should never come into contact with the foliage of growing potatoes as it causes totally unacceptable tuber cracking which results in non-marketable tubers. Assert primarily caused tuber cracking.
8. Harmony extra, either drifting or at field labeled rates, should never come into contact with the foliage of growing potatoes as it causes totally unacceptable tuber folding which results in non-marketable tubers. Harmony extra primarily caused folded tubers.
9. Small amounts of ally, glean, or amber drifting onto growing potatoes likely would cause slight to minimal potato tuber injury. Of these three, ally and glean would cause the least injury.

10. The russett burbank variety was more sensitive to the herbicides in general, and specifically to oust, than the centennial russett variety. If potatoes had to be planted back into oust contaminated soil, the use of russett burbank potatoes would be a poor choice; use of centennial russett would be the preferred choice.

11. Although some of the herbicides significantly reduced tuber yields, a more objectionable aspect was the effects of some of these herbicides on potato tuber quality; some herbicides produced tubers which were totally non-marketable.

12. This research suggests that some of these herbicides, and especially oust, may adversely affect potato tubers at very low concentrations. This raises the possibility of herbicides such as oust being able to adversely affect potato tuber growth at concentrations below current analytical detection limits. This interaction of potatoes with herbicides which have biological activity at extremely low concentrations warrants further research.

DATA SUMMARY - SIGNIFICANT TREATMENT EFFECTS DENOTED BY \*0\*

DATE	TREATMENT	IRR.	HEIGHT	CHLOROSIS	% INJURY	CANOPY	* FLOWERS	TUBERS/PLT	TUBERS/PLT	g/TUBER	SHORHAL	CRACKED	% FOLDED	% POP CORN	% KNobby	% INJISC.
APPL.	(02./RD)		(7/14/88)	(7/14/88)	(7/14/88)	(SQ. FT.)	(KG)	(NUMBER)	(NUMBER)							
7/01/88	CHECK	RB														
7/14/88	CHECK	CR														
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## PREPLANT INCORPORATED OUST SOIL STUDY - RUSSET BURBANK - GREENHOUSE RESEARCH

Effects of Oust on Russet Burbank potatoes when preplant incorporated into the soil at 2.5 to 500 ppt.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS NO	FOLDED TUBERS NO	CRACKED TUBERS NO	KNOBBY TUBERS NO	POPCORN TUBERS NO	MINISCUL TUBERS NO	CNSTRCTD TUBERS NO	TOTAL ABNORMAL TUBERS
		Amt	Ds	Rate	Stg	Code	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89
01	CHECK					4.5a	0.0b	0.0c	0.0b	0.0b	0.5b	0.3a	0.8c
02	CHECK					3.3ab	0.0b	0.0c	0.0b	0.0b	0.5b	0.5a	1.0c
03	2.5					2.0abc	0.0b	0.0c	0.8ab	0.0b	0.3b	0.0a	1.0c
04	5					3.0abc	0.5b	1.3b	1.0ab	0.0b	0.8b	0.0a	3.5ab
05	10					3.0abc	0.8ab	0.3c	0.5ab	0.0b	0.3b	0.5a	2.3bc
06	25					3.0abc	0.3b	0.3c	0.5ab	0.0b	0.8b	0.0a	1.8bc
07	50					2.0abc	0.5b	0.0c	1.8a	0.0b	1.8a	0.0a	4.0ab
08	100					1.3bc	1.8a	2.3a	0.3ab	0.0b	0.8b	0.0a	5.0a
09	200					0.5bc	1.0ab	2.0ab	0.8ab	0.0b	0.0b	0.0a	3.8ab
10	500					0.3c	0.0b	0.3c	1.3ab	0.5a	0.0b	0.0a	2.0bc

Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS #	PLANT HEIGHT CM	FOLIAGE WGT G	ROOT WGT G	INITIAL TUBERS #	TOTAL TUBERS #	TUBER WGT G
		Amt	Ds	Rate	Stg	Code	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89
01	CHECK					2.0ab	154.0a	230.75a	25.33a	5.0a	5.3ab	112.07a
02	CHECK					2.0ab	168.5a	165.63ab	35.45a	2.8a	4.0ab	100.52a
03	2.5					2.0ab	171.3a	175.05ab	40.00a	3.0a	3.3ab	95.32a
04	5					2.0ab	173.0a	195.00ab	28.60a	3.8a	6.3a	95.85a
05	10					2.5a	163.8a	193.75ab	30.35a	3.3a	5.5ab	111.90a
06	25					1.0b	161.3a	150.00b	31.45a	2.0a	4.8ab	96.63a
07	50					2.0ab	156.3a	166.25ab	35.17a	5.0a	5.8ab	96.15a
08	100					1.8ab	177.5a	188.00ab	32.85a	8.5a	4.8ab	88.53a
09	200					1.3b	173.8a	186.60ab	31.33a	8.3a	4.3ab	70.57ab
10	500					2.0ab	171.3a	179.25ab	32.88a	3.3a	2.3b	14.57b

## CENTENNIAL RUSSET - GREENHOUSE

Effects of Oust on Centennial Russet potatoes when preplant incorporated into the soil at 2.5 to 100 ppt.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS NO	FOLDED TUBERS NO	CRACKED TUBERS NO	KNOBBY TUBERS NO	POPCORN TUBERS NO	MINISCUL TUBERS NO	CNSTRCTD TUBERS NO	TOTAL ABNORMAL TUBERS
		Amt	Ds	Rate	Stg	Code	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89
01	CHECK					4.8a	0.0a	0.0a	0.0a	0.0a	0.0a	0.0a	0a
02	2.5					3.8a	0.3a	0.5a	0.3a	0.0a	0.3a	0.0a	1a
03	10					4.5a	0.0a	0.0a	0.3a	0.0a	0.0a	0.3a	1a
04	50					3.5a	0.5a	0.3a	0.0a	0.0a	0.8a	0.0a	2a
05	100					5.0a	0.0a	0.0a	0.0a	0.0a	0.3a	0.0a	0a



Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS	PLANT HGT	FOLIAGE WGT	ROOT WGT	INITIAL TUBERS	TOTAL TUBERS	TUBER WGT
		Amt	Ds Rate	Stg	Code	#	CM	G	G	#	#	G
						4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89
01	CHECK					2.8a	109.0a	163.70a	44.30a	2.5a	5.3a	196.60a
02	2.5					3.5a	108.0a	146.75a	30.30a	5.3a	5.8a	188.45a
03	10					3.0a	123.8a	173.00a	58.50a	3.3a	5.5a	209.20a
04	50					2.5a	125.3a	144.00a	24.75a	2.3a	5.5a	162.00a
05	100					3.3a	120.0a	138.70a	29.50a	2.0a	5.3a	173.25a

**RUSSET NORKOTAH - GREENHOUSE**

Effects of Oust on Russet Norkotah potatoes when preplant incorporated into the soil at 2.5 to 100 ppt.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS	FOLDED TUBERS	CRACKED TUBERS	KNobby TUBERS	POPCORN TUBERS	MINISCUL TUBERS	CNSTRCTD TUBERS	TOTAL ABNORMAL TUBERS
		Amt	Ds Rate	Stg	Code	NO	NO	NO	NO	NO	NO	NO	NO
						4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89
01	CHECK					7.5a	0.0a	0.0a	0.0a	0.0a	0.5b	0.0a	1b
02	2.5					8.0a	0.0a	0.0a	0.0a	0.0a	0.3b	0.0a	0b
03	10					5.3a	0.3a	0.0a	0.5a	0.0a	0.5b	0.0a	1b
04	50					4.8a	0.5a	0.3a	0.8a	0.0a	2.8a	0.0a	4a
05	100					4.5a	0.0a	0.0a	0.0a	0.0a	1.5ab	0.0a	2b

**RUSSET NORKOTAH**

Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS	PLANT HGT	FOLIAGE WGT	ROOT WGT	INITIAL TUBERS	TOTAL TUBERS	TUBER WGT
		Amt	Ds Rate	Stg	Code	#	CM	G	G	#	#	G
						4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89
01	CHECK					3.3b	85.8b	271.25a	54.3ab	3.3a	7.8a	332.25a
02	2.5					4.8a	88.3b	275.50a	111.5a	6.0a	9.3a	344.50a
03	10					2.0b	100.3b	186.25b	56.0ab	2.8a	6.8a	216.50ab
04	50					3.3b	98.3b	217.88ab	37.8b	5.3a	8.8a	265.75ab
05	100					2.3b	122.5a	219.00ab	36.3b	2.8a	7.0a	188.88b

**BANDED STUDIES****RUSSET BURBANK - GREENHOUSE**

Effects of Oust on Russet Burbank potatoes when preplant incorporated into the soil at 2.5 to 100 ppt in a narrow band around the potato seed pieces.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS	FOLDED TUBERS	CRACKED TUBERS	KNobby TUBERS	POPCORN TUBERS	MINISCUL TUBERS	CNSTRCTD TUBERS	TOTAL ABNORMAL TUBERS
		Amt	Ds Rate	Stg	Code	NO	NO	NO	NO	NO	NO	NO	NO
						4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89
01	CHECK					4.5a	0.0b	0.0a	0.0a	0.0a	0.8a	0.0a	1c
02	10					6.0a	2.0a	0.0a	1.3a	0.0a	2.0a	0.0a	5a
03	50					5.0a	0.5b	0.0a	0.5a	0.0a	0.5a	0.0a	2bc
04	100					3.3a	0.8ab	0.0a	1.8a	0.0a	1.8a	0.0a	4ab

Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS	PLANT HEIGHT	FOLIAGE WGT	ROOT WGT	INITIAL TUBERS	TOTAL TUBERS	TUBER WGT
		Amt	Ds	Rate	Stg	Code	#	CM	G	G	#	#
						4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89
01	CHECK					2.0a	157.8a	189.63a	49.25a	4.3a	5.3a	178.38a
02	10					2.0a	167.0a	256.00a	59.50a	6.0a	9.0a	205.75a
03	50					2.5a	171.0a	269.50a	77.00a	5.0a	6.5a	167.50a
04	100					2.3a	163.3a	247.00a	68.00a	4.0a	7.5a	214.75a

## CENTENNIAL RUSSET - GREENHOUSE

Effects of Oust on Centennial Russet potatoes when preplant incorporated into the soil at 10 to 100 ppt in a narrow band around the potato seed pieces.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS	FOLDED TUBERS	CRACKED TUBERS	KNOBBY TUBERS	POPCORN TUBERS	MINISCUL TUBERS	CNSTRCTD TUBERS	TOTAL ABNORMAL TUBERS
		Amt	Ds	Rate	Stg	Code	NO	NO	NO	NO	NO	NO	NO
						4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89
01	CHECK					5.3a	0.0a	0.0a	0.0a	0.0a	0.5a	0.0a	1a
02	10					6.8a	0.0a	0.0a	0.0a	0.0a	0.5a	0.0a	1a
04	100					7.3a	0.5a	0.0a	0.0a	0.0a	0.5a	0.0a	1a

Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS	PLANT HEIGHT	FOLIAGE WGT	ROOT WGT	INITIAL TUBERS	TOTAL TUBERS	TUBER WGT
		Amt	Ds	Rate	Stg	Code	#	CM	G	G	#	#
						4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	
01	CHECK					3.5a	124.8a	174.85a	46.88a	3.5a	7.0a	211.38a
02	10					3.3a	115.0a	170.57a	42.33a	3.0a	7.0a	230.02a
04	100					3.8a	113.3a	180.75a	51.00a	3.5a	8.5a	268.00a

## RUSSET NORKOTAH - GREENHOUSE

Effects of Oust on Russet Norkotah potatoes when preplant incorporated into the soil at 10 to 100 ppt in a narrow band around the potato seed pieces.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS	FOLDED TUBERS	CRACKED TUBERS	KNOBBY TUBERS	POPCORN TUBERS	MINISCUL TUBERS	CNSTRCTD TUBERS	TOTAL ABNORMAL TUBERS
		Amt	Ds	Rate	Stg	Code	NO	NO	NO	NO	NO	NO	NO
						4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	
01	CHECK					5.0a	0.0a	0.0a	0.0a	0.0a	1.0a	0.0a	1a
02	10					5.8a	0.3a	0.0a	0.3a	0.0a	1.5a	0.0a	2a
04	100					4.8a	0.3a	0.0a	1.0a	0.0a	1.5a	0.0a	3a

Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS	PLANT HEIGHT	FOLIAGE WGT	ROOT WGT	INITIAL TUBERS	TOTAL TUBERS	TUBER WGT
		Amt	Ds	Rate	Stg	Code	#	CM	G	G	#	#
						4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	
01	CHECK					2.3a	107.5a	201.75a	48.75a	6.3a	6.0a	235.40a
02	10					3.0a	122.5a	230.80a	30.52a	4.3a	8.3a	233.38a
04	100					3.8a	121.5a	333.75a	64.00a	4.8a	8.0a	279.50a

## SURFACE TREATMENTS

## RUSSET BURBANK - GREENHOUSE

Effects of Oust on Russet Burbank potatoes when applied preemerge to the soil surface at 300 ppt after planting of the tubers.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS	FOLDED TUBERS	CRACKED TUBERS	KNOBBY TUBERS	POPCORN TUBERS	MINISCUL TUBERS	CNSTRCTD TUBERS	TOTAL ABNORMAL TUBERS
		Amt	Ds Rate	Stg	Code	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89
01	CHECK					2.8a	0.0a	0.0a	0.0a	0.0a	0.3a	0.0a	0b
02	300 ppt					0.3b	0.3a	4.3a	1.0a	0.0a	1.3a	0.0a	7a

Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS #	PLANT HEIGHT CM	FOLIAGE WGT G	ROOT WGT G	INITIAL TUBERS #	TOTAL TUBERS #	TUBER WGT G
		Amt	Ds Rate	Stg	Code	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89
01	CHECK					1.3a	158.0a	147.25a	38.53a	2.3a	3.0b	113.88a
02	300 ppt					1.5a	155.0a	141.40a	53.77a	7.0a	6.8a	43.48b

## CENTENNIAL RUSSET - GREENHOUSE

Effects of Oust on Centennial Russet potatoes when applied preemerge to the soil surface at 300 ppt after planting of the tubers.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS	FOLDED TUBERS	CRACKED TUBERS	KNOBBY TUBERS	POPCORN TUBERS	MINISCUL TUBERS	CNSTRCTD TUBERS	TOTAL ABNORMAL TUBERS
		Amt	Ds Rate	Stg	Code	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89
01	CHECK					4.5a	0.0a	0.0a	0.0a	0.0a	0.3a	0.0a	0a
02	300 ppt					2.5a	0.0a	0.3a	0.0a	0.0a	1.5a	0.0a	2a

Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS #	PLANT HEIGHT CM	FOLIAGE WGT G	ROOT WGT G	INITIAL TUBERS #	TOTAL TUBERS #	TUBER WGT G
		Amt	Ds Rate	Stg	Code	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89
01	CHECK					2.5a	107.3a	107.60a	31.13a	3.0a	4.8a	151.05a
02	300 ppt					3.0a	79.8a	113.03a	46.38a	3.8a	4.3a	116.92a

## RUSSET NORKOTAH - GREENHOUSE

Effects of Oust on Russet Norkotah potatoes when applied preemerge to the soil surface at 300 ppt after planting of the tubers.

Trt No	Treatment Name	Form Fm		Grow Appl		NORMAL TUBERS	FOLDED TUBERS	CRACKED TUBERS	KNOBBY TUBERS	POPCORN TUBERS	MINISCUL TUBERS	CNSTRCTD TUBERS	TOTAL ABNORMAL TUBERS
		Amt	Ds Rate	Stg	Code	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89	4-25-89
01	CHECK					6.5a	0.3a	0.0a	0.0a	0.0a	0.3a	0.0a	1a
02	300 ppt					2.5a	0.3a	0.3a	0.3a	0.0a	0.5a	0.0a	1a

Trt No	Treatment Name	Form Fm		Grow Appl		SHOOTS #	PLANT HEIGHT CM	FOLIAGE WGT G	ROOT WGT G	INITIAL TUBERS #	TOTAL TUBERS #	TUBER WGT G
		Amt	Ds Rate	Stg	Code	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89	4-21-89
01	CHECK					2.8a	130.0a	300.75a	54.25a	3.8a	7.3a	286.50a
02	300 ppt					1.8a	113.5a	901.60a	59.58a	4.5a	3.8a	70.65b

## STUDY 2.

Influence of oust, harmony extra, and assert on 1989 potato growth on plants produced from tubers of plants which received foliar applications of these herbicides in 1988. 1989 study at Seltzer's corner.

	NORM TUBER NO.	NORM TUBER KG	CRACK TUBER NO.	CRACK TUBER KG	FOLD TUBER NO.	FOLD TUBER KG	KNOBB TUBER NO.	KNOBB TUBER KG	MINIS TUBER NO.	MINIS TUBER G	ABNOR TUBER NO.	ABNOR TUBER KG.
CHECK	76 b	9.4 b	1.50	0.08	1.30	0.20	0.83	0.27	2.80	15.20	6.43	0.57
OUST 2 ppb	79 b	8.4 b	4.20	0.53	5.50	0.55	5.33	1.22	3.00	7.70	18.03	2.31
OUST 4 ppb	60 c	5.6 c	3.70	0.41	5.30	0.54	3.00	0.67	2.70	8.00	14.70	1.63
HARM 4 ppb	99 a	11 a	3.80	0.78	4.50	0.65	1.00	0.15	1.50	2.90	10.80	1.58
HARM 8 ppb	73 bc	8.1 b	4.70	0.91	5.20	0.85	2.80	0.73	3.00	7.70	15.70	2.50
ASSERT 235 ppb	77 b	9.2 b	3.30	0.54	5.80	0.56	2.00	0.30	2.00	6.40	13.10	1.41
SIGNIFICANCE *	*		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.		

Colorado State University  
1989 PLANTBACK OF TUBERS FROM PLANTS SPRAYED  
IN 1988

Project Code: POTA5079  
Location : SLV

By: Weed Science  
Cooperator : GARY FRANC

Trt No	Treatment Name	Form	Fm	Grow	Appl	RB PERCENT EMERGEN RB	RB STEMS/ 10 RB PLANTS	CR % TUBER GERMINAT	CR NUMBER STEMS/ 10 PLANT
01	CHECK					93ab	40a	86a	44b
02	OUST 2 PPB					97a	34a	93a	44b
03	OUST 4 PPB					87b	38a	93a	24c
04	HARMEX 4 PPB					100a	49a	97a	48ab
05	HARMEX 8 PPB					97a	45a	83a	43b
06	ASSERT 235PP					100a	52a	80a	58a

STUDY 3.

Colorado State University  
HERBICIDE INJURY TO POTATOES

Project Code: POTA608

By: Weed Science

Location: SAN LUIS VALLEY

Cooperator: GARY FRANC

t Treatment Name	Form Fm Amt Ds Rate	Rate Grow Unit Stg	Appl Code	BARLEY	BARLEY	RB NORM	RB NORM	CR NORM	CR NORM
				% INJURY 6-13-89	BU/A SUMMER 7-10-89	# TUBERS	# KG	# TUBERS	# KG
CHECK		JUNE		0.0d	67a	81.7ab	3.00ab	21.7b	0.77a
1 OUST	75 DF .071	oz/A	JUNE	11.7c	50a	39.0d	1.27c	24.3b	0.87a
2 OUST	75 DF .141	oz/A	JUNE	31.7b	48a	61.3a-d	2.30abc	25.0b	1.07a
3 GLEAN	75 DF .035	oz/A	JUNE	0.0d	63a	55.7bcd	1.93abc	25.0b	0.90a
4 GLEAN	75 DF .071	oz/A	JUNE	0.0d	59a	62.3a-d	2.37abc	21.3b	0.83a
5 HARMONY EXTR	75 DF .142	oz/A	JUNE	0.0d	69a	70.0abc	2.70ab	26.3ab	1.07a
6 HARMONY EXTR	75 DF .282	oz/A	JUNE	0.0d	66a	51.3cd	1.63bc	43.0a	1.20a
7 AMBER	75 DF .071	oz/A	JUNE	0.0d	63a	63.7a-d	1.87abc	21.0b	0.83a
8 ALLY	60 DF .018	oz/A	JUNE	0.0d	57a	72.7abc	2.43abc	32.0ab	1.00a
9 ASSERT	2.5 L .47	lb/A	JUNE	0.0d	51a	65.7a-d	2.13abc	27.7ab	0.93a
10 CHECK		JULY		0.0d	56a	69.0a-d	2.20abc	25.0b	1.07a
11 OUST	75 DF .071	oz/A	JULY	13.3c	56a	56.3bcd	2.07abc	26.3ab	0.83a
12 OUST	75 DF .141	oz/A	JULY	40.0a	62a	61.7a-d	2.40abc	26.0ab	0.90a
13 GLEAN	75 DF .035	oz/A	JULY	0.0d	66a	87.0a	3.23a	29.7ab	1.03a
14 GLEAN	75 DF .071	oz/A	JULY	0.0d	71a	72.0abc	2.40abc	28.3ab	1.03a
15 HARMONY EXTR	75 DF .142	oz/A	JULY	0.0d	60a	60.7a-d	2.10abc	36.0ab	1.07a
16 HARMONY EXTR	75 DF .282	oz/A	JULY	0.0d	65a	49.0cd	2.13abc	28.0ab	1.10a
17 AMBER	75 DF .071	oz/A	JULY	0.0d	74a	83.0ab	2.87ab	25.0b	0.87a
18 ALLY	60 DF .018	oz/A	JULY	0.0d	53a	61.3a-d	1.70bc	29.7ab	1.10a
19 ASSERT	2.5 L .47	lb/A	JULY	0.0d	78a	68.7a-d	2.33abc	20.3b	0.97a

## STUDY 4.

Influence of various ultra-low PPI oust levels on development of four potato varieties in the San Luis Valley.

	NORM TUBER NO.	NORM TUBER KG	CRACK TUBER NO.	CRACK TUBER KG	FOLD TUBER NO.	FOLD TUBER KG	KNOBB TUBER NO.	KNOBB TUBER KG	MINIS TUBER NO.	MINIS TUBER G	ABNOR TUBER NO.	ABNOR TUBER KG.
CHECK	52 a	3.9 ab	0.00 b	0.00 b	0.10 c	0.00 c	0.00	0.00	2.08	1.89	2.18	0.00
OUST 2.5 ppt	49 ab	2.4 bcd	0.08 b	0.00 b	0.70 bc	0.03 bc	0.17	0.03	2.28	2.64	4.20	0.06
OUST 5 ppt	51 ab	2.5 abcd	0.17 b	0.01 b	1.70 abc	0.08 abc	0.25	0.01	3.25	3.05	5.37	0.01
OUST 10 ppt	46 abc	3.0 ab	0.08 b	0.01 b	1.60 abc	0.07 abc	0.25	0.05	2.25	2.21	4.18	0.13
OUST 20 ppt	54 a	3.3 a	0.42 b	0.02 b	1.80 abc	0.10 abc	0.67	0.06	2.42	2.28	5.31	0.18
OUST 50 ppt	54 a	2.8 abc	0.33 b	0.02 b	1.90 abc	0.10 abc	0.50	0.02	3.08	2.67	5.81	0.32
OUST 100 ppt	48 ab	2.1 cd	0.17 b	0.02 b	2.00 abc	0.17 abc	0.50	0.06	1.58	1.55	4.25	0.25
OUST 200 ppt	39 bc	1.9 d	1.00 b	0.04 b	3.50 a	0.24 ab	0.58	0.05	1.58	1.76	6.66	0.34
OUST 500 ppt	36 c	1.8 d	2.87 a	0.15 a	3.40 ab	0.25 a	0.67	0.04	1.88	1.76	8.82	0.45
CHECK	55 a	3.0 ab	0.00 b	0.00 b	0.00 c	0.00 c	0.00	0.00	3.62	4.14	3.62	0.00
SIGNIFICANCE	*	*	*	*	*	*	n.s.	n.s.	n.s.	n.s.		

VARIETY	NORM TUBER NO.	NORM TUBER KG	CRACK TUBER NO.	CRACK TUBER KG	FOLD TUBER NO.	FOLD TUBER KG	KNOBB TUBER NO.	KNOBB TUBER KG	MINIS TUBER NO.	MINIS TUBER G	ABNOR TUBER NO.	ABNOR TUBER KG.
RUSSET BURBANK	72a	3.9a	0.47	0.03	3.9a	0.27a	1.20a	0.11 a	2.80	2.72	8.37	0.41
CENTENNIAL RUSSET	20d	0.9d	0.37	0.01	0.2b	0.01b	0.03b	0.00 b	1.78	1.97	2.38	0.02
SANGRE	56b	3.1b	0.82	0.05	0.9b	0.06b	0.00b	0.00 b	2.82	2.82	4.54	0.11
NORKOTAH RUSSET	45c	2.4c	0.40	0.01	1.6b	0.07b	0.20b	0.00 b	2.21	2.06	4.41	0.08
SIGNIFICANCE	*	*	n.s.	n.s.	*	*	*	*	n.s.	n.s.		