FOLIAR SYMPTOMS AND YIELD RESPONSE OF POTATO CULTIVARS TO SENCOR/LEXONE (METRIBUZEN) AND PROWL (PENDIMETHALIN)

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When the potato cultivar Shepody began to be grown in the Columbia Basin of Washington in the early 1980's it became quite apparent that it was susceptible to damage from the herbicide metribuzen (Sencor/Lexone). As a result of this situation, the question arose as to whether other cultivars of potatoes had differential sensitivity to this and other herbicides registered for and used by potato producers in Washington State. In 1985 a preliminary trial was established at the WSU Othello research unit. Five cultivars were post emergence treated with three herbicides (Table 1) according to label directions. No data was obtained, but observations indicated that there was a differential plant response to the herbicides applied.

Table 1. Potato Cultivars and Herbicides in the 1985 Preliminary Trial.

Cultivars	Herbicides
Lemhi	Sencor
Russet Burbank	Prowl
Ranger Russet	Eptan
Nooksack	
Shepody	

In this same time frame Dr. Steven Love, a University of Idaho potato research scientist, was testing the clones and cultivars entered in the Western Regional Cultivar trials for sensitivity to metribuzen. His results also indicated there was differential response of cultivars to metribuzen (Table 2). The 1988 data was utilized to develop a model to predict yield reduction from observed plant damage (Table 2).

This Presentation is part of the Proceedings of the 1992 Washington State Potato Conference & Trade Fair.

Table 2. Cultivar Response to Metribuzen*
University of Idaho

CULTIVAR	1988		1989	
	% PLANT DAMAGE	% ACTUAL YIELD REDUCTION	% PLANT DAMAGE	% ESTIMATED YIELD REDUCTION
LEMHI RUSSET	15	27	0	0
NORGOLD RUSSET	0	0	0	0
RUSSET BURBANK	10	0	10	0
RED LASODA	13	15	5	0
SHEPODY	97	99	88	69

* Application Rate 1 lb. A.I./Acre

As a result it became apparent there was a need to determine if plant damage resulted when labeled herbicides were applied to the cultivars being grown or available to be grown by Washington potato producers. If there was damage then there was a need to know how much, if any, yield loss occurred when plant symptoms were present.

Sencor, Prowl and a combination of Sencor and Prowl were applied to ten potato cultivars (Table 3) in both 1990 and 1991. Maximum label rate and latest allowable time post emergence were used to maximize opportunity to detect plant damage potential. Non-treated check was hand-weeded in 1990 and treated with Duel according to label directions in 1991.

Table 3. Cultivars Used in Herbicide Sensitivity Trials in 1990 and 1991.

Frontier	Shepody
HiLite	Red Norland
Norgold	Red La Soda
Norkotah	Norchip
Russet Burbank	Gemchip

Injury readings were taken 10 and 17 days after application of the herbicides in 1990 and 11 and 21 days in 1991. Plant injury was rated on a 0 to 10 scale in 1990, 0 = no injury, 10 = dead. In 1991 the plant injury scale was 1 = no injury, 10 = dead.

Table 4. Effect of 3 Herbicide Treatments on Total Tuber Yield.

Total Yield (CWT/A)				
Treatment	Control	Sencor	Sencor/Prowl	Prowl
Frontier	431	400	406	402
Gemchip	490	500	400	486
HiLite	447	497	486	543
Norchip	488	524	469	508
Norgold	385	434	429	417
Norkotah	428	456	441	391
Russet Burbank	426	439	441	555
Red La Soda	523	517	468	566
Red Norland	495	518	486	520
Shepody	428	382	352	413

The sensitivity of Frontier, Gemchip, HiLite, Norchip, Norgold and Norkotah to the three herbicides is similar to or less than Russet Burbank sensitivity (Table 5). Red LaSoda, Red Norland and Shepody are more sensitive to the Sencor/Prowl combination than Russet Burbank. Red Norland and Shepody are also more sensitive to Prowl than Russet Burbank. They are also more sensitive to Sencor alone than is Russet Burbank.

With the exception of HiLite, Red Norland and Shepody, these plants recovered from the damage between the first and second reading dates (Table 6). Shepody had a higher injury rating on the late reading date from both Sencor and the Sencor/Prowl combination, but not from Prowl along. This indicates the response is more likely due to the Sencor. HiLite also had higher injury ratings from Sencor at the later reading. Red Norland, on the other hand showed an increase in damage between readings to Prowl alone but not to the Sencor/Prowl combination.

All three herbicide treatments resulted in plant injury ratings higher than the non-treated control on all cultivars (Tables 5 & 6).

Total yield was not influenced in proportion to or consistent with the damage rating (Table 4). Frontier, Norland and Shepody yield was decreased when treated regardless of the herbicides. HiLite, Norkotah and Russet Burbank yields increased when treated regardless of the herbicides.

Gemchip, Norchip and Red Norland had higher yields when treated with Sencor compared to the non-treated control. Red LaSoda yield was the same for Sencor and non-treated control, lower for the Sencor/Prowl combination and higher with Prowl. Red LaSoda, Russet Burbank, HiLite and Red Norland had higher yields when treated with Prowl than with any other treatment.

Table 5. Plant Injury Rating for 3 Herbicide Treatments on 10 Cultivars.

Damage Rating
Average of 2 Reading Dates and 2 Years

	Control*	Sencor	Sencor/Prowl	Prowl
Frontier	.5	.938	1.143	1.001
Gemchip	.5	.923	1.625	1.141
HiLite	.5	.901	1.031	1.063
Norchip	.5	1.205	1.986	1.908
Norgold	.5	.876	1.701	1.861
Norkotah	.5	1.015	1.501	1.205
Russet Burbank	.5	1.360	1.923	1.875
Red da Soda	.5	1.303	2.328	1.688
Red Norland	.5	1.563	2.266	2.190
Shepody	.5	4.784	4.921	2.319

* No injury occurred on control. 0 = no injury in 1990, 1 = no injury in 1991. Average no injury rating = .5.

All cultivars except Norgold and Norkotah had the same as or lower total yield when treated with the Sencor/Prowl combination than when treated with Prowl alone. Prowl treatment gave yields equal to or higher than Sencor treatment except on Gemchip, Norchip, Norkotah and Norgold.

Tuber specific gravity from the herbicide treatments was either equal to or higher than the non-treated control except for Red Norland treated with Prowl which tended to be lower than the non-treated check (Table 7).

SUMMARY

1. All cultivars tested showed detectable plant injury.
2. Sencor, Prowl, and Sencor/Prowl caused detectable plant response.
3. With the exception of Red Norland and Shepody plant response was the same or was reduced by 17/20 days after treatment.
4. Shepody treated with Sencor or Sencor/Prowl had more severe plant injury with time following treatment.
5. Red Norland treated with Prowl had more severe injury with time following treatment.
6. Yield response was not consistent with severity of plant injury.
7. Plant injury was not indicative of yield response.

Table 6. Plant Injury Rating for 3 Herbicide Treatments on 10 Cultivars at 2 Reading dates.

	DAMAGE RATING							
	10/11 days after treatment					17/21 days after treatment		
	Control*	Sencor	Sencor/ Prowl	Prowl	Control	Sencor	Sencor/ Prowl	Prowl
Frontier	.5	.875	1.190	1.062	.5	1.0	1.015	.938
Gemchip	.5	.97	1.720	1.248	.5	.875	1.53	1.033
HiLite	.5	.875	1.093	1.188	.5	.94	.968	.938
Norchip	.5	1.22	2.063	2.003	.5	1.19	1.908	1.813
Norgold	.5	.938	1.753	1.903	.5	.813	1.649	1.813
Norkotah	.5	1.030	1.563	1.315	.5	1.0	1.438	1.095
Russet Burbank	.5	1.470	2.063	1.970	.5	1.250	1.783	1.780
Red La Soda	.5	1.450	2.563	1.813	.5	1.155	2.093	1.563
Red Norland	.5	1.780	2.468	2.128	.5	1.345	2.063	2.253
Shepody	.5	4.503	4.623	2.408	.5	5.065	5.218	2.158

* See footnote for Table 5.

Table 7. Effect of 3 Herbicide Treatments on Tuber Specific Gravity.

Tuber Specific Gravity				
Treatment	Control	Sencor	Sencor/Prowl	Prowl
Frontier	1.078	1.080	1.078	1.079
Gemchip	1.076	1.078	1.078	1.078
HiLite	1.072	1.074	1.074	1.073
Norchip	1.081	1.083	1.082	1.081
Norgold	1.069	1.071	1.071	1.075
Norkotah	1.070	1.072	1.072	1.070
Russet Burbank	1.076	1.079	1.078	1.079
Red La Soda	1.070	1.075	1.072	1.070
Red Norland	1.063	1.064	1.064	1.062
Shepody	1.082	1.084	1.086	1.082