

PROJECT TITLE: Amber Plantback Study

YEAR/PROJECT: 1989/754

PROJECT PERSONNEL: Leader- Vern R. Stewart, Todd K. Keener - Research Specialists, NWARC, Kalispell, MT

OBJECTIVE: To evaluate the effect of Amber residue on sensitive crops used in rotations of small grains and legumes.

SUMMARY: Alfalfa, lentils, and barley were seeded to areas with Amber residue. Lentils and alfalfa were sensitive to higher rates of Amber and Glean applied the previous spring.

RESEARCH METHODS:

Herbicides were applied the previous fall and spring to an area which was maintained through the winter and prepared for seeding in the spring to indicator crops for detection of chemical residue. The area was shallow disced in the fall of 1988 as well as in the spring of 1989. A brillion soil packer was used to prepare the seedbed. Alfalfa ( Arrow at 10 #/A ), lentils ( Chilean at 50 #/A ), and barley ( Gallatin 60 #/A ) were planted using a Research Plot seeder. Notes and observation were made throughout the season. Alfalfa biomass yields were obtained using an Almaco plot harvester, the barley yields by a Hege 125B combine, and lentil yields by hand. The area was kept weed free throughout the season by use of Foast, Hoelon, Bronate where needed, and by hand weeding.

RESULTS:

Barley replanted into Amber herbicide residues did not indicate any chemical injury of the components measured. Biomass data showed both alfalfa and lentils were injured by Glean applied in the previous fall and spring, as well as high rates of Amber in the spring. This pattern proved true through out the readings in injury, vigor, percent stand, and height. The data shows that Amber was more injurious with the previous spring application and that Glean was more injurious at the 20 gram/hectare rate than any other treatment. Table 1-11.

FUTURE FLANS:

Tested area will be planted to susceptible crops one more year to determine if there is still residue of the herbicides Amber and Glean, in the soil.

Agronomic data from the Amber Plantback Study conducted on the Northwestern Agricultural Research Center in Kalispell, MT in 1989.

Table 1. YIELD

Treatment	Appln/Rate	----- B A R L E Y 9/11 -----		
		Yield Bu/A	Test Wt Lbs/Bu	% Plump
Amber	Fall/7.5 gm	68.9	48.55	90.82
Amber	Fall/10 gm	81.9	49.55	93.53
Amber	Fall/20 gm	90.3	49.30	94.22
Amber	Fall/30 gm	76.7	49.02	93.43
Glean	Fall/20 gm	75.4	48.85	92.30
Amber	Sprg/7.5 gm	75.9	49.02	92.13
Amber	Sprg/10 gm	78.0	49.17	91.93
Amber	Sprg/20 gm	83.8	48.77	93.50
Amber	Sprg/30 gm	77.3	48.75	92.40
Glean	Sprg/20 gm	82.8	48.77	91.23
Check	-----	73.4	49.10	91.80
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OVERALL MEAN =		78.5	48.99	92.48
F-RATIO TRTS =		1.561 NS	1.303 NS	1.546 NS
P-VALUE TRTS =		.1618	.2704	.1668
CV (SE/MEAN) =		5.906	.5126	.9253
LSD(0.05 by t)=		13.40	.7253	2.471

Table 2. Biomass measurements ( Kg/32 sq ft )

Treatment	Appln/Rate	Alfalfa 8/2	Alfalfa 9/26	Lentil 8/7
Amber	Fall/7.5 gm	4.963	5.465	5.253
Amber	Fall/10 gm	5.613	6.783	5.310
Amber	Fall/20 gm	5.962	8.368	5.508
Amber	Fall/30 gm	3.775	5.950	3.940
Glean	Fall/20 gm	2.300 b	4.015 b	3.090 b
Amber	Sprg/7.5 gm	5.250	6.582	5.358
Amber	Sprg/10 gm	4.700	4.750	3.978
Amber	Sprg/20 gm	2.200 b	4.582	3.392
Amber	Sprg/30 gm	.4625 b	1.648 b	2.633 b
Glean	Sprg/20 gm	1.712 b	2.382 b	2.973 b
Check	-----	5.325	6.957	4.818
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OVERALL MEAN =		3.842	5.226	4.205
F-RATIO TRTS =		10.40	7.613	4.205
P-VALUE TRTS =		.0000**	.0000**	.0008**
CV (SE/MEAN) =		15.07	13.99	12.56
LSD(0.05 by t)=		1.672	2.112	1.526

Table 3. CROP INJURY May 31, 1989 1/

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	.0000	.0000	.0000
Amber	Fall/10 gm	.0000	.0000	.0000
Amber	Fall/20 gm	.0000	.3750	.0000
Amber	Fall/30 gm	.0000	.5000	.1250
Glean	Fall/20 gm	.0000	1.000 a	.8750 a
Amber	Sprg/7.5 gm	.0000	.0000	.0000
Amber	Sprg/10 gm	.0000	.0000	.1250
Amber	Sprg/20 gm	.0000	.1250	.1250
Amber	Sprg/30 gm	.0000	.5000	.7500 a
Glean	Sprg/20 gm	.0000	.7500 a	.7500 a
Check	-----	.0000	.0000	.0000
OVERALL MEAN =		.0000	.2955	.2500
F-RATIO TRTS =		.0000	3.852*	2.946**
P-VALUE TRTS =		.0000	.0016	.0092
CV (SE/MEAN) =		.0000	61.18	82.39
LSD(0.05 by t)=		.0000	.5221	.5949

Table 4. CROP INJURY July 19, 1989 1/

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	.0000	.0000	.0000
Amber	Fall/10 gm	.0000	.2500	.1250
Amber	Fall/20 gm	.0000	.2500	.0000
Amber	Fall/30 gm	.3750	1.500	1.250
Glean	Fall/20 gm	1.500	2.750 a	2.000
Amber	Sprg/7.5 gm	.0000	.1250	.0000
Amber	Sprg/10 gm	.1250	.8750	.1250
Amber	Sprg/20 gm	1.500	4.000 a	3.250 a
Amber	Sprg/30 gm	2.250	4.000 a	7.200 a
Glean	Sprg/20 gm	1.500	4.975 a	6.725 a
Check	-----	.0000	.0000	.0000
OVERALL MEAN =		.6591	1.702	1.880
F-RATIO TRTS =		1.816 NS	5.061**	6.941**
P-VALUE TRTS =		.0956	.0002	.0000
CV (SE/MEAN) =		95.47	49.27	55.07
LSD(0.05 by t)=		1.817	2.422	2.989

\* Indicates statistical significance at the .05 level

\*\* Indicates statistical significance at the .01 level

a/ Values significantly greater than the check at the .01 or .05 level

b/ Values significantly less than the check at the .01 or .05 level

Table 5. PERCENT STAND May 31, 1989

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	100.0	100.0	100.0
Amber	Fall/10 gm	100.0	100.0	100.0
Amber	Fall/20 gm	100.0	95.00	100.0
Amber	Fall/30 gm	100.0	92.50	93.75
Glean	Fall/20 gm	100.0	91.25	85.00 b
Amber	Sprg/7.5 gm	100.0	100.0	100.0
Amber	Sprg/10 gm	100.0	98.75	97.50
Amber	Sprg/20 gm	100.0	98.75	97.50
Amber	Sprg/30 gm	100.0	93.75	96.25
Glean	Sprg/20 gm	100.0	91.00	87.50 b
Check	-----	100.0	100.0	100.0
OVERALL MEAN =		100.0	96.45	96.14
F-RATIO TRTS =		.0000 NS	1.860 NS	5.864 **
P-VALUE TRTS =		.0000	.0872	.0001
CV (SE/MEAN) =		.0000	2.872	2.284
LSD(0.05 by t)=		.0000	8.001	6.341

Table 6. PERCENT STAND July 19, 1989

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	100.0	100.0	100.0
Amber	Fall/10 gm	99.25	97.50	99.00
Amber	Fall/20 gm	98.25	100.0	98.75
Amber	Fall/30 gm	94.25	90.25	78.75
Glean	Fall/20 gm	84.25	67.50 b	71.25 b
Amber	Sprg/7.5 gm	100.0	98.75	98.75
Amber	Sprg/10 gm	96.75	95.50	94.00
Amber	Sprg/20 gm	87.50	50.00 b	42.50 b
Amber	Sprg/30 gm	73.50	50.00 b	30.50 b
Glean	Sprg/20 gm	88.25	42.50 b	30.75 b
Check	-----	100.0	100.0	100.0
OVERALL MEAN =		92.91	81.09	76.75
F-RATIO TRTS =		1.748	6.101**	8.495**
P-VALUE TRTS =		.1101	.0000	.0000
CV (SE/MEAN) =		6.997	11.76	12.88
LSD(0.05 by t)=		18.78	27.55	28.56

Table 7. VIGOR June 16, 1989 /2

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	9.000	5.000	6.000 b
Amber	Fall/10 gm	9.125	7.875 b	9.250
Amber	Fall/20 gm	9.500	6.125 b	6.750 b
Amber	Fall/30 gm	9.250	3.750 b	4.375 b
Glean	Fall/20 gm	8.625	3.625 b	2.625 b
Amber	Sprg/7.5 gm	9.875	7.125 b	7.750
Amber	Sprg/10 gm	9.250	6.000 b	4.375 b
Amber	Sprg/20 gm	9.375	4.250 b	2.875 b
Amber	Sprg/30 gm	9.000	3.125 b	1.750 b
Glean	Sprg/20 gm	9.750	3.250 b	2.625 b
Check	-----	10.00	10.00	10.00
OVERALL MEAN =		9.341	5.466	5.307
F-RATIO TRTS =		1.468 NS	21.24**	10.98**
P-VALUE TRTS =		.1951	.0000	.0000
CV (SE/MEAN) =		3.666	8.720	16.17
LSD(0.05 by t)=		.9889	1.377	2.478

Table 8. VIGOR July 19, 1989 /2

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	10.00	9.875	10.00
Amber	Fall/10 gm	10.00	9.875	10.00
Amber	Fall/20 gm	9.975	9.750	10.00
Amber	Fall/30 gm	9.200	9.350	9.300
Glean	Fall/20 gm	8.750	8.250 b	← 8.600
Amber	Sprg/7.5 gm	9.900	9.875	9.875
Amber	Sprg/10 gm	9.900	9.825	9.875
Amber	Sprg/20 gm	8.875	5.750 b	6.500 b
Amber	Sprg/30 gm	7.875	6.000 b	4.375 b
Glean	Sprg/20 gm	8.625	5.000 b	4.500 b
Check	-----	10.00	10.00	10.00
OVERALL MEAN =		11.32	8.505	8.457
F-RATIO TRTS =		.9525 NS	10.63**	6.042**
P-VALUE TRTS =		.5073	.0000	.0000
CV (SE/MEAN) =		57.24	7.038	10.80
LSD(0.05 by t)=		18.71	1.729	2.639

Table 9. HEIGHT ( INCHES ) June 16, 1989

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	6.375	4.250	2.750 b
Amber	Fall/10 gm	7.125	4.875	3.750
Amber	Fall/20 gm	6.750	4.250	3.125
Amber	Fall/30 gm	6.375	3.625 b	2.125 b
Glean	Fall/20 gm	6.250	3.450 b	1.125 b
Amber	Sprg/7.5 gm	6.750	4.825	3.000
Amber	Sprg/10 gm	6.625	4.250	1.825 b
Amber	Sprg/20 gm	6.625	2.700 b	.7750 b
Amber	Sprg/30 gm	6.000	2.500 b	.6500 b
Glean	Sprg/20 gm	6.500	2.625 b	1.200 b
Check	-----	6.875	4.875	3.750
OVERALL MEAN	=	6.568	3.839	2.189
F-RATIO TRTS	=	1.053 NS	13.79**	11.38**
P-VALUE TRTS	=	.4286	.0000	.0000
CV (SE/MEAN)	=	4.645	6.426	15.64
LSD(0.05 by t)=		.8812	.7124	.9889

Table 10. HEIGHT ( INCHES ) July 21, 1989

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	30.1	14.2	20.7
Amber	Fall/10 gm	32.4	15.0	21.3
Amber	Fall/20 gm	33.0	15.2	22.1
Amber	Fall/30 gm	31.6	14.2	18.2
Glean	Fall/20 gm	30.2	13.1	12.6 b
Amber	Sprg/7.5 gm	32.2	14.6	20.1
Amber	Sprg/10 gm	31.9	15.2	19.8
Amber	Sprg/20 gm	31.5	11.6	14.2 b
Amber	Sprg/30 gm	31.0	9.4 b	1.5 b
Glean	Sprg/20 gm	32.2	8.7 b	7.9 b
Check	-----	31.9	14.8	22.0
OVERALL MEAN	=	31.60	13.20	16.40
F-RATIO TRTS	=	1.728	3.406**	10.41**
P-VALUE TRTS	=	.1147	.0037	.0000
CV (SE/MEAN)	=	2.126	9.622	12.66
LSD(0.05 by t)=		1.942	3.678	5.990

Table 11. PLANTS PER FOOT OF ROW ( June 12, 1989 )

Treatment	Appln/Rate	Barley	Lentil	Alfalfa
Amber	Fall/7.5 gm	5.900	3.925	7.425
Amber	Fall/10 gm	6.175	4.975	8.500
Amber	Fall/20 gm	5.650	4.525	9.175
Amber	Fall/30 gm	5.525	4.325	6.000
Glean	Fall/20 gm	5.425	4.400	5.575
Amber	Sprg/7.5 gm	6.350	4.850	6.675
Amber	Sprg/10 gm	6.150	5.325	7.750
Amber	Sprg/20 gm	7.400	4.800	7.575
Amber	Sprg/30 gm	5.250	4.500	6.100
Glean	Sprg/20 gm	6.500	4.075	6.750
Check	-----	6.325	5.250	8.100
OVERALL MEAN =		6.059	4.632	7.239
F-RATIO TRTS =		1.723 NS	1.307 NS	1.397 NS
P-VALUE TRTS =		.1161	.2685	.2249
CV (SE/MEAN) =		7.653	8.536	13.14
LSD(0.05 by t)=		1.339	1.142	2.748

- \* Indicates values significantly greater than the check (.05 level)  
 \*\* Indicates values significantly greater than the check (.01 level)  
 a/ Values significantly greater than the check  
 b/ Values significantly less than the check

1/ Crop Injury ratings: rated 5/13/89 and 7/19/89 on 0-10 scale where "0" indicates no injury and "10" indicates plants dead due to chemical phytotoxicity.

2/ Vigor ratings: rated 6/16/89 and 7/19/89 on 0-10 scale where "10" indicates normal healthy plants and "0" indicates plants dead due to chemical injury.

Varieties grown: Gallatin spring barley, Chilean lentils, and Arrow alfalfa. Seeded may 8, 1989.