

Effect of glyphosate droplet concentration on drift injury to irrigated potato. Harlene Hatterman-Valenti and Collin Auwarter.

A study was conducted at the Northern Plains Potato Grower's Association Irrigation Research site near Inkster, ND to determine if increasing the glyphosate droplet concentration by reducing the water volume would increase injury to potato and whether this increase in injury would be similar at all growth stages. This was accomplished by comparing plant and tuber injury from glyphosate applied at 20, 5, or 1 GPA to 'Russet Burbank' plants at the tuber initiation (TI), early bulking (EB), and late bulking stages (LB). The potato variety 'Russet Burbank' was planted on May 24 using a Harrison double-row planter with 12-inch spacing between seed pieces and 36 inches between rows. Glyphosate was applied at one-sixth, and one-twelfth the standard use rate (0.125 and 0.0625 lb ai/A) with a CO₂-pressurized ATV sprayer equipped with HB/HC #2 and #5 nozzles with a spray volume of 20 GPA (70 psi and 1.8 mph), 5 GPA (25 psi and 3.6 mph), or 1 GPA (25 psi and 7.2 mph). AMS was included to the spray solution and reduced accordingly. The field design was a randomized complete block, factorial arrangement, with four replicates. Maintenance programs were conducted throughout the growing season to apply fungicides and insecticides. Plants were harvested September 25 with a single-row Hasia harvester and then graded at Fargo. Application, environmental, crop, and yield data are listed below:

Date:	7/23/09	8/6/09	9/9/09
Treatment:	TI	EB	LB
Air temperature (F):	68	70	73
Rel. hum. (%):	62	61	57
Wind (mph):	7	6	8
Wind direction:	SE	SE	SW

Visual injury symptoms from glyphosate applications were subtle (chlorosis at growing points) regardless of glyphosate rate or application timing. Plants treated with glyphosate recovered quicker and showed less injury symptoms than previous years due to better environmental conditions in 2009. Plants treated with 0.13 lb/A glyphosate at the TI stage when applied at 20 GPA or at the EB stage when applied at 5 GPA had significant marketable and total yield loss from the reduction in tuber size. Plants treated with glyphosate produced similar number of tubers in comparison to the untreated except when plants were treated with 0.06 lb/A glyphosate applied at 20 GPA at the TI stage, which had significantly more tubers. Additional tuber loss would have occurred if tubers were to be sold for fresh market due to growth cracks and elephant hide skin in many of the tubers when plants were treated with glyphosate at the TI or EB stage.

Potato tuber set in response to glyphosate droplet concentration.

Treatment	< 4 oz	4-6 oz	6-8 oz	8-10 oz	10-12 oz	>12 oz	Total	>4 oz	
	tuber no.								
Untreated	97	45	28	20	7	8	205	108	
RU 0.125 TI									
20 GPA	159	20	7	4	2	1	192	33	
RU 0.0625									
TI 20 GPA	217	51	22	9	6	3	307	91	
RU 0.125 TI									
1 GPA	103	47.8	34	20	9	8	221	118	
RU 0.0625									
TI 1 GPA	140	42	27	11	6	5	230	90	
RU 0.125 EB									
20 GPA	130	56	43	18	6	4	257	127	
RU 0.0625									
EB 20 GPA	105	59	43	24	10	9	249	145	
RU 0.125 EB									
5 GPA	151	45	19	4	3	2	224	73	
RU 0.0625									
EB 5 GPA	129	58	33	14	5	5	243	115	
RU 0.125 EB									
1 GPA	141	54	34	12	5	5	250	109	
RU 0.0625									
EB 1 GPA	120	54	37	16	5	7	239	119	
RU 0.125 LB									
20 GPA	108	51	33	17	6	7	222	114	
RU 0.0625									
LB 20 GPA	114	56	33	19	8	10	239	125	
RU 0.125 LB									
5 GPA	113	57	33	20	8	7	237	124	
RU 0.0625									
LB 5 GPA	126	60	35	20	10	10	260	134	
RU 0.125 LB									
1 GPA	129	61	32	14	8	4	247	118	
RU 0.0625									
LB 1 GPA	124	60	31	19	7	2	243	119	
LSD (P=0.05)	47	20	13	9	4	NS	76	40	

Potato yield and grade in response to glyphosate droplet concentration.

Treatment	< 4 oz	4-6 oz	6-8 oz	8-10 oz	10-12 oz	>12 oz	Total	>4 oz
	Cwt/A							
Untreated	93	102	82	71	33	46	426	334
RU 0.125 TI								
20 GPA	119	49	21	16	9	6	220	101
RU 0.0625 TI								
20 GPA	156	91	54	29	24	18	371	215
RU 0.125 TI								
1 GPA	83	87	86	65	34	42	397	315
RU 0.0625 TI								
1 GPA	123	97	90	48	34	36	428	305
RU 0.125 EB								
20 GPA	104	102	107	58	23	19	413	309
RU 0.0625								
EB 20 GPA	82	106	107	77	38	51	460	379
RU 0.125 EB								
5 GPA	120	81	48	13	10	9	280	160
RU 0.0625								
EB 5 GPA	102	105	84	44	19	24	377	275
RU 0.125 EB								
1 GPA	120	97	83	39	20	24	382	262
RU 0.0625								
EB 1 GPA	98	98	91	51	20	35	393	295
RU 0.125 LB								
20 GPA	92	93	84	55	23	35	381	289
RU 0.0625								
LB 20 GPA	85	99	82	63	31	52	412	327
RU 0.125 LB								
5 GPA	93	104	82	64	32	35	409	316
RU 0.0625								
LB 5 GPA	100	109	88	64	38	53	451	351
RU 0.125 LB								
1 GPA	100	111	81	46	30	18	386	286
RU 0.0625								
LB 1 GPA	102	108	76	61	28	11	386	284
LSD (P=0.05)	32	33	29	28	15	26	101	85