

Impact of ground rolling on herbicide efficacy with pinto bean, Carrington, 2023.
(Greg Endres, Joe Ikley, Mike Ostlie and Kristin Simons)

The field trial was conducted at the NDSU Carrington Research Extension Center with support from Northarvest Dry Bean Growers Association to examine weed control and response of pinto bean with timing of ground rolling and application of PRE and POST herbicides. Experimental design was a randomized complete block with four replications. Previous crop in 2022 was spring wheat. The dryland experiment was established on a conventional-tilled loam soil with 2.7% organic matter and 7.7 pH (0- to 6-inch depth). Trial area was tilled on May 30 and planted June 7 with fungicide-treated 'ND Rodeo' in 30-inch rows. Ground rolling followed planting on June 7, either before or after application of PRE herbicide, for treatments (trts) 2,4, 6 and 7 with a Turftime roller at 4-5 mph on dry soil surface, 86-89 degree air temperature and partly sunny sky. Ground rolling was performed on June 27, either before or after application of POST herbicide, for trts 8-10 over V1-2 growth stage pinto bean plants, on a dry soil surface, 75-77 degree air temperature and partly sunny sky. Herbicide trts were applied using a hand-boom sprayer delivering 17 gpa (PRE) or 14 gpa (POST) through TeeJet XR 80015VS flat-fan nozzles at 35 psi. Spartan Elite at 25 fl oz/acre (A) was PRE applied on June 7 at 81 degree soil and 89 degree air temperatures, 37% RH and 12 mph wind; followed by 0.1 inch of rain on June 8-9 and 2.2 inches of rain on June 22-24. Varisto (bentazon&imazamox) at 21 fl oz/A plus Reflex (fomesafen) at 12 fl oz/A plus Trizenta (clethodim) at 2.7 fl oz/A plus Destiny HC (HSMSO) at 20 fl oz/A plus AMS (ammonium sulfate) at 8.5 lb/100 gal spray solution was applied June 27 at 73 degree air temperature, 70% RH and 6 mph wind to 1- to 6-inch tall green foxtail, and 1- to 6-inch tall or wide common lambsquarters, common puslane, kochia, and redroot and prostrate pigweed. Mature plants were hand-pulled and seed harvested with a plot combine on September 20.

Broadleaf weed density was very low (Table 1). Green foxtail population was greatest without herbicide or with POST herbicide, due to herbicide resistance. Among trts, ground rolling generally did not alter weed populations versus no rolling. Trts that included PRE herbicide suppressed green foxtail (64-76% control). Roll timing did not influence PRE or POST herbicide efficacy.

Table 1. Weed control with timing of ground roll and herbicide application, Carrington, 2023.

Treatment	Stand		Green foxtail control				
	plants/ft ²						
No.	Timing ^a		26-Jun				
	Ground roll	Herbicide	Green foxtail	Broadleaves ^b	%		
			26-Jun	12-Jul	26-Jul		
1	x	x	32	2	0	0	0
2	7-Jun	x	33	3	0	0	0
3	x	POST	31	4	0	43	40
4	7-Jun	POST	31	1	0	45	41
5	x	PRE/POST	8	0	72	71	70
6	After PRE herbicide	PRE/POST	9	0	71	73	70
7	Before PRE herbicide	PRE/POST	13	0	71	71	67
8	27-Jun	PRE	16	0	74	64	48
9	After POST herbicide	PRE/POST	13	0	73	74	72
10	Before POST herbicide	PRE/POST	7	0	76	76	74
mean			19	1	44	52	48
CV (%)			29.6	94.0	8.0	9.6	9.5
LSD (0.05)			8	2	5	7	7

^aPRE=June 7; POST=June 27.

^bBroadleaves=common lambsquarters, common puslane, kochia, and redroot and prostrate pigweed.

Days from pinto bean planting to plant emergence were similar among trts (Table 2). Early season plant density about 2-3 weeks after emergence averaged about 40,000 plants/A across the trial; plant stand was similar among trts. Plant injury (visual evaluation of reduced biomass and plant stand) on June 26 was absent with rolling before or after application of PRE herbicide (trts 6 and 7; data not shown). Plant injury with rolling before or after application of POST herbicide was similar (trts 9 and 10; Table 2). Injury scores generated on July 6 and 12 resulted from POST rolling mechanical injury (primarily stem bending and cracking) and response to POST herbicide trts. Incidence of mechanical plant damage from POST rolling ranged from 19-34% of plants (trts 8-10; data not shown). Seed yield was greatest with PRE/POST herbicides (trts 5-7 and 9-10), ranging from 1750-2380 lb/A. Seed quality was similar among trts.

In summary, timing of ground rolling based on application of PRE and POST herbicides did not influence weed density or control. Though pinto bean injury occurred with POST rolling and POST herbicides, seed yield was greatest with PRE/POST herbicide trts, primarily due to green foxtail control with PRE herbicide.

Table 2. Pinto bean response to timing of ground roll and herbicide application, Carrington, 2023.

Treatment			Plant					Seed			
			Emerge	Stand		Injury		Yield	Test weight	Count	Protein
Timing ^a	26-Jun	6-Jul		6-Jul	12-Jul	lb/A	lb/bu				
No.	Ground roll	Herbicide	DOY ^b	plants/A		%					
1	x	x	165	37,850	40,500	0	0	426	61.9	1138	20.2
2	7-Jun	x	165	38,510	40,510	0	0	426	62.4	1165	20.0
3	x	POST	165	34,530	37,190	5	4	1104	62.4	1384	20.0
4	7-Jun	POST	165	37,850	40,510	6	6	987	62.3	1456	19.8
5	x	PRE/POST	164	39,180	41,170	0	4	1749	62.2	1325	20.2
6	After PRE herbicide	PRE/POST	164	39,840	41,170	9	7	2362	62.8	1245	20.3
7	Before PRE herbicide	PRE/POST	164	41,170	41,830	9	9	2379	63.1	1258	20.1
8	27-Jun	PRE	165	41,831	44,490	4	5	1284	62.6	1407	20.2
9	After POST herbicide	PRE/POST	164	37,850	38,510	12	14	2077	62.4	1274	20.6
10	Before POST herbicide	PRE/POST	164	42,500	42,500	13	18	2247	63.1	1283	20.2
mean			164	39,110	40,840	6	7	1561	62.6	1293	20.2
CV (%)			0.2	15.5	10.0	103.0	105.0	32.7	1.2	27.3	1.7
LSD (0.05)			NS	NS	NS	9	10	743	NS	NS	NS

^aPRE=June 7; POST=June 27.

^bDOY=day of year; 164=June 13.