

Pinto bean response to winter rye cover crop, Carrington, 2017.

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A field study was initiated at the NDSU Carrington Research Extension Center with support from Northarvest Dry Bean Growers Association to examine the performance of pinto bean with winter rye grown as a cover or companion crop. Experimental design was a randomized complete block with four replications. The dryland trial was established on a Heimdal-Emrick loam soil. 'ND Dylan' rye was seeded in 7-inch rows at about 90 lb/A on September 20, 2016. 'Lariat' was direct planted into rye or rye residue (except tilled plots) in 21-inch rows on May 31, 2017 (Jday 151). Rye (tillering stage) was terminated by tillage (2x roto-till) on April 28 [33 days preplant (PP)] to establish a 'check' (treatment 1). Also, rye was PP terminated by glyphosate (0.77 lb ae/A) plus NIS+AMS (Class Act NG; 2.5% v/v) on April 28 followed by a second application of glyphosate (1 lb ae/A) on May 11 (treatment 2). Rye (boot stage) was late PP terminated by glyphosate (1 lb ae/A) on May 27 (treatment 3). Treatment 4 plots were land rolled on June 6 with rye in the flowering stage. Imazamox (0.03 lb ai/A) plus MSO (Destiny HC; 24 fl oz/A) and UAN (24 fl oz/A) was applied on June 26 [26 days after planting (DAP)] for terminating rye (dough stage) in treatments 4-5 and general weed control across trial. Herbicide treatments were applied with a hand-boom sprayer delivering 17 gpa through 80015 flat-fan nozzles at 35 psi. Pinto bean plants from treatments 1-3 were hand-pulled for field drying on October 6 and seed harvested with a plot combine on October 13. Plants from treatments 4-5 were pulled on October 13 and seed harvested on October 20.

Early PP rye termination had quicker plant emergence (5-8 days), flowering (7-21 days), and maturity (5-26 days) compared to late PP and POST rye termination (Table 1). Also, plants generally were taller, had a darker green color, and greater canopy closure with early PP rye termination versus later rye termination. With the exception of the early PP rye termination with herbicide, plant stand was similar among treatments. Seed yield was highest with early PP rye termination and lowest with POST rye termination. Test weight and seed size were similar among treatments with PP rye termination and greater than POST rye termination. The advantages with plant development, and seed yield with the early PP rye termination were likely due to greater soil moisture availability from reduced rye growth compared to the results with delaying rye termination, especially POST.

Grass control on July 10 (40 DAP) was excellent (96-99%) with PP glyphosate (trts 2-3), while broadleaf weed control was excellent (94-95%) with late PP glyphosate (trt 3) and delaying rye termination until 26 DAP (trts 4-5) (Table 2). With the exception of grass control with PP tillage (trt 1), grass and broadleaf control on July 24 (54 DAP) was excellent (92-97%) with POST imazamox plus rye residue among all treatments. Black medic emerged in the trial as a prominent weed during the growing season but was adequately controlled (84-93%) in trts 3-5, likely due to greater rye residue levels present compared to early PP terminated rye. Overall, trt 3 provided desirable control (84-99%) among all weeds in the trial.

Table 1. Pinto bean response to rye cover crop, Carrington, 2017.

Treatment		Plant ^b							Seed		
No.	Rye termination method ^a	Emergence	Stand (12-Jun)	Height (3-Jul)	Color (3-Jul)	Flower (R1)	Canopy closure (4-Aug)	Maturity (R9)	Yield	Test weight	Count
		Jday	plt/A	cm	1 to 10	Jday	%	Jday	lb/A	lb/bu	no./lb
1	Tillage - early PP	160	49,960	25	2	200	75	263	2524	57.3	1123
2	Herbicide - early PP	161	58,181	23	4	201	73	256	2890	58.0	1133
3	Herbicide - late PP	166	43,636	15	6	208	58	268	2259	57.7	1192
4	Ground roll/POST herbicide	168	47,430	19	6	218	30	281	958	50.4	1365
5	POST herbicide	168	44,268	21	6	221	26	282	422	43.7	1320
mean		164	48,695	20	5	207	52	270	2024	54.7	1221
CV (%)		0.4	12.9	13.5	9.7	0.7	9.1	2.6	18.7	6.3	4.8
LSD (0.05)		1	9645	4	1	2	7	11	606	5.5	92

^aTrts 1 and 2=April 28; Trt 3=May 27; Trts 4 and 5=June 26.

^bJday: 164=June 13; 207=July 26; 270=Sep 27. Plant stage at stand count = VC-2.

Table 2. Weed control with rye cover crop in pinto bean, Carrington, 2017.

Treatment		Weed control ^b				
		10-Jul		24-Jul		
No.	Rye termination method ^a	Grass	Broadleaf	Grass	Broadleaf	Black medic
		%				
1	Tillage - early PP	73	74	79	95	63
2	Herbicide - early PP	97	76	97	94	69
3	Herbicide - late PP	99	95	92	97	84
4	Ground roll/POST herbicide	71	94	92	94	90
5	POST herbicide	67	94	94	94	93
mean		81	86	91	95	64
CV (%)		2.2	6.4	4.6	4.1	8.0
LSD (0.05)		3	8	6	NS	9

^aTrts 1 and 2=April 28; Trt 3=May 27; Trts 4 and 5=June 26. Treatments 1-3 also received POST herbicide on June 26 for general weed control.

^bGrass=rye, and green and yellow foxtail; Broadleaf=black medic (July 10 evaluation), common lambsquarters, common purslane, dandelion, redroot pigweed, shephardspurse, and wild buckwheat.