

Pinto bean response to winter rye cover crop, Carrington, 2017.
(Greg Endres and Mike Ostlie)

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.