Soybean response following winter rye cover crop, Wishek, 2020.

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The third-year trial was conducted in 2020 at the NDSU Carrington Research Extension Center off-station crop research site near Wishek, with support from the ND Soybean Council, to examine the performance of soybean with winter rye grown as a preplant (PP) cover crop. Experimental design was a randomized complete block with four replications. The dryland trial was established on a reduced-till loam soil with spring soil test indicating 23 ppm P (Olsen), 173 ppm K, 3.4% organic matter, 6.5 pH (0-6" depth), and 0.18 mmho/cm soluble salts (0-6" depth). 'ND Dylan' rye was direct seeded into wheat stubble in 7-inch rows at 60 lb/A on October 8, 2019. 'PFS19B04' seed inoculated with rhizobium bacteria was planted in 14-inch rows on May 27, 2020. NDAWN monthly rain (inches): May = 1.7; June = 1.6; July = 3.1; August = 2.9; and September = 0.7; for a season total of 10.0 inches. Soybean seed was harvested with a plot combine on September 25.

Treatments for rye termination methods with herbicides:

1. Conventional system check (no rye). PP glyphosate (Roundup PowerMax at 28.4 fl oz/A) plus NIS+AMS (2.5% v/v; Class-Act NG) plus pyroxasulfone&saflufenacil&imazethapyr (Zidua Pro at 4.5 fl oz/A) on May 29 (2 days after planting) to jointing- to boot-stage (6- to 15-inch tall) rye.
2. PP glyphosate plus NIS+AMS on May 15 (12 days before planting) to tillering (5- to 6-inch tall) rye.
3. PP glyphosate plus NIS+AMS on May 29.

POST glyphosate plus NIS+AMS (0.5% v/v; Blue Diamond) was applied on July 1 across all plots for general weed control with soybean at V3 growth stage. Herbicides were applied with a hand-boom sprayer delivering 14 gpa at 35 psi with TJ Turbo 02 nozzles.

Rye plant density on May 15 averaged 762,000 plants/A across trial. Topsoil moisture (Table) 2 days following soybean planting was greater with the conventional system check (no rye) and preplant rye termination (trts 1 and 2) compared to delaying rye termination (trt 3). Subsequent soil moisture checks in July were statistically similar among treatments. Green foxtail control about one month after soybean planting was greater with the check, likely due to use of the soil-applied herbicide, compared to treatments with rye cover crop. After trial maintenance application of glyphosate on July 1, weed control was similar and adequate among treatments (data not shown).

Table. Soil moisture, weed control and soybean response with preplant winter rye cover crop, Wishek, 2020.

					Soybean							
					Plant			Seed				
Trt no.	Topsoil moisture (%)[a]			Green foxtail control (1-Jul)	Stand (1-Jul; V3 stage)	Canopy (27-Jul)	Physiological maturity	Yield	Test weight	Count	Oil	Protein
	29-May	1-Jul	27-Jul	%	plt/A	%	day of year[b]	bu/A	lb/bu	no./lb	%	
1	18.3	24.2	22.3	89	179,290	86	260	45.0	58.0	3,324	20.2	35.5
2	20.7	21.6	20.0	67	237,620	84	259	40.0	57.9	3,363	20.0	35.8
3	16.2	20.5	22.3	70	170,750	81	261	29.4	58.0	3,534	20.0	35.5
Mean	18.4	22.1	21.5	75	195,890	84	260	37.2	58.0	3420	20.1	35.6
CV (%)	11.7	14.1	8.4	1.7	21.8	8.1	0.3	12.5	0.3	5.7	1.1	1.1
LSD (0.10)	3.0	NS	NS	2	NS	NS	1	7.0	NS	NS	NS	NS

[a]Extech digital soil moisture meter (model MO750) at 4-inch soil depth.

[b]260=September 16.

Soybean plant stand was similar among treatments (Table), though treatment 2 tended to have a greater density than other treatments. Plant canopy ground cover, visually evaluated at soybean R3 growth stage, was similar among treatments. Plant maturity ranged from 1-2 days among treatments. Seed yield ranged from 40-45 bu/A with the check and early rye termination, and was greater than yield with delayed rye termination. Reduced yield with treatment 3 likely was due to additional water use by rye that was not available to soybean during early plant establishment. Seed quality was similar among treatments.