Pinto bean response to low dose rates of dicamba and glyphosate, Carrington, 2018.
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The multi-year field study continued (from 2015) at the NDSU Carrington Research Extension Center to examine the response of pinto bean to low dose (drift) rates of dicamba and glyphosate. Experimental design was a randomized complete block with three replications. The experiment was conducted on a dryland, conventionally-tilled Heimdal-Emrick loam soil. 'ND Palomino' was planted on May 29 in 22-inch rows at a rate to achieve ≥70,000 plants/A. Herbicide treatments were applied with a CO_2-hand-boom plot sprayer delivering 9 gal/A at 35 psi through 8001 flat fan nozzles on July 9 with 74 F, 73% RH and 4 mph wind to bud to early bloom (V8-R1) plants. XtendiMax (dicamba) application rates were targeted at 0.0193, 0.193 and 1.93 fl oz/A; Roundup PowerMax (glyphosate) rates were targeted at 0.025, 0.25 and 2.5 fl oz/A; plus herbicide combinations paired at low, medium and high rates. All treatments included Activator 90 (NIS) at 0.25% v/v. Plants from three herbicide-treated rows at 12 ft length of treatment numbers 1, and 5-6 were hand-pulled and placed in windrows on August 30 and seed harvested with a plot combine on August 31 (Table). Plants from treatments 2 and 8 were hand-pulled and placed in windrows on September 14 and seed harvested on September 25. Plants from treatments 3-4, 7, and 9-10 were killed by frost (28 F) on September 28. Plants from treatments 3, 7, and 9 were hand-pulled and placed in windrows on October 2 and seed harvested on October 18. Plants from treatments 4 and 10 were too heavily damaged by herbicide to produce seed, thus were not harvested. Sub-samples were taken from harvested seed and greenhouse planted December 10 to measure seed germination, and seedling vigor and dry weight.

Plant injury, based on visual evaluation of biomass reduction and chlorosis/necrosis, increased with increasing herbicide rates (Table). Compared to the untreated check, canopy cover decreased with increasing herbicide rates. The high rate of dicamba, glyphosate, and dicamba plus glyphosate had 29-35% canopy reduction compared to the untreated check. Plant maturity was similar among the untreated check and the low and medium rates of glyphosate, but was delayed 16-35 days with all other herbicide treatments. Seed yield with the low rate of dicamba (trt 2), and the low and medium rates of glyphosate (trts 5 and 6) were statistically similar to the untreated check. Yield reduction with the medium rate of dicamba, high rate of glyphosate, and low and medium rates of dicamba plus glyphosate ranged from 7 to 50 percent compared to yield with the untreated check. The high rates of dicamba, and dicamba plus glyphosate resulted in no seed yield. Greenhouse planted seed indicated similar germination (90-97%), seedling vigor (5), and seedling dry weight (23.6-27.1 g/plant) with low rate of dicamba, glyphosate, and combination; and medium glyphosate rate as untreated check.

Table.

Treatment		Plant						Seed			Seedling[1]	
		Biomass reduction (%)		Chlorosis/ necrosis (0-9)[2]		Canopy closure (%)	PM[3]	Yield	count	Germ	Vigor	Dry weight
No.	Description[4]	7/20	7/30	7/20	7/30	7/30	Jday	lb/A	no./lb	%	0-5	g/plt
1	untreated check	0	0	0	0	93	237	1579	1500	90	5	23.6
2	XtendiMax L	27	27	2	3	82	253	1205	1447	94	5	26.4
3	XtendiMax M	34	38	4	4	71	272	348	1562	40	2	12.9
4	XtendiMax H	47	52	6	6	66	272	0	x	x	x	x
5	RU PM L	7	7	0	1	89	237	1183	1549	95	5	25.9
6	RU PM M	11	12	1	1	91	237	1451	1505	97	5	27.1
7	RU PM H	38	38	5	4	67	272	117	1478	39	2	10.8
8	XtendiMax + RU PM L	28	29	3	3	81	253	785	1553	95	5	26.3
9	XtendiMax + RU PM M	38	40	4	4	72	272	371	1357	45	3	13.3
10	XtendiMax + RU PM H	55	65	7	7	60	272	0	x	x	x	x
mean		28	31	1	3	77	258	880	1494	63	4	21.0
C.V. (%)		20.7	17.4	13.2	15.5	5.4	0.2	29.7	10.1	7.7	15.1	12.9
LSD (0.05)		10	9	1	1	7	1	458	NS	15	1	4.7

[1]Greenhouse-grown seedling measurements taken December 26. Vigor: 0=very poor, 5=excellent. Average plant weight (grams).

[2]0=none, 9=all tissue affected.

[3]PM=Physiological maturity. 28 degrees occurred on Jday 271 to terminate growth of treatments 3-4, 7 and 9-10.

[4]XtendiMax rates (fl oz/A): L=0.0193; M=0.193; H=1.93. Roundup PowerMax rates (fl oz/A): L=0.025; M=0.25; H=2.5.