Field experiments were established at Manhattan and Hays, Kansas to evaluate 1) non-Xtend soybean injury and yield loss from dicamba exposure at different growth stages, rates, and multiple exposures, and 2) injury and yield loss from dicamba exposure on different non-Xtend soybean varieties and traits. Soybeans were planted in 30 inch rows following standard agronomic practices at the KSU Ashland Bottoms Agronomy Farm south of Manhattan, KS on May 22, 2018 and at the Western Kansas Agriculture Research Center at Hays, KS on May 25. A good stand of soybeans was established at Manhattan, but a marginal stand of soybeans was established at Hays due to heavy rains and soil crusting following planting. The experiments at Hays were later terminated after dicamba drift damage to soybeans occurred from dicamba applications outside of the plot area.

Dicamba Rate, Timing, and Multiple Exposures

Engenia herbicide was applied at 1/100, 1/500 and 1/1000 of the standard use rate of 12.8 oz/a (0.5 lb ae/a) to soybeans at the V3 stage on June 12, R1 stage on July 2, and R3 stage on July 16. Dicamba injury symptoms were evident within 1 week after treatment at each timing and were visually evaluated at weekly intervals until late in the season. Dicamba symptomology on the non-Xtend soybeans was maximized about 3 to 4 weeks after treatment. Soybeans treated with dicamba at the V3 stage expressed early season leaf cupping, but seemed to have recovered fairly well by 8 weeks after treatment, regardless of the application rate (1/100, 1/500, and 1/1000 X). Injury from dicamba applications at the R1 and R3 stages included leaf cupping, stunting, epinasty, and abnormal growing point and pod development. Symptoms from the R1 and R3 applications were more persistent and evident through the remainder of the growing season. The most severe soybean injury occurred with the multiple application timings and at the highest rates (Tables 1 and 2).

Table 1. Soybean injury from simulated dicamba drift 4 weeks after exsporsure at Manhattan, KS

Application	Dicamba Rate		
Timing	1/1000X	1/500X	1/100X
		(% injury)	
V3	13	20	27
R1	30	39	56
R3	36	49	60
V3/R1	36	45	74
V3/R3	43	49	78
R1/R3	53	63	75
V3/R1/R3	58	64	80

Lsd (5%) = 4

Table 2. Soybean injury from simulated dicamba drift on September 10 at Manhattan, KS.

Application Timing	Dicamba Rate		
	1/1000X	1/500X	1/100X
		(% injury)	
V3	5	5	10
R1	35	50	69
R3	39	46	64
V3/R1	40	51	75
V3/R3	36	40	71
R1/R3	50	64	73
V3/R1/R3	53	64	76

Lsd (5%) = 4

Soybean harvest was delayed and complicated due to unusually wet conditions in the fall. Soybean yield reduction from dicamba injury was not as great as visual injury ratings (Tables 3 and 4). Soybean yield loss was minimal from exposure during the V3 stage, regardless of exposure rate, or from the 1/1000X exposure rate, regardless of exposure stage or with multiple exposure timings. The greatest yield loss was from multiple exposure events and at the highest exposure rate of 1/100X dicamba. Soybean yield was reduced 68% from exposure to dicamba at the 1/100X rate at all three timings of V3/R1/R3, and 53% from the 1/100X rate at the R1 and R3 timings. Soybean yield was reduced 25% from a single exposure of 1/100X rate at the R1 stage and 18% from the 1/100X rate at the R3 growth stage.

Table 3. Soybean yield with simulated dicamba drift at Manhattan, KS.

Application Timing	Dicamba Rate		
	1/1000X	1/500X	1/100X
		(Bushels/Acre)	
V3	40	42	46
R1	43	42	35
R3	38	39	38
V3/R1	39	44	28
V3/R3	46	44	28
R1/R3	39	35	22
V3/R1/R3	41	36	15

Untreated = 46 bu/acre; Lsd (5%) = 4

Table 4. Soybean yield loss from simulated dicamba drift at Manhattan, KS.

Application Timing	Dicamba Rate		
	1/1000X	1/500X	1/100X
		(% reduction)	
V3	14	10	2
R1	7	10	25
R3	18	15	18
V3/R1	16	5	39
V3/R3	2	6	32
R1/R3	17	25	53
V3/R1/R3	12	23	68
Lsd (5%) = 12			

Soybean Variety/Trait Response

Visual soybean injury varied among varieties and timings (Table 5). Soybean injury was higher from exposure at the R1 than the V3 stage of growth, similar to the other experiment. Visual injury from dicamba tended to be highest on the Stine 40BA02 variety and lowest on the Credenz 4746 LL variety. Lower injury on the Credenz 4746 variety may have been partially due to the longer maturity, but application on the same dates.

Table 5. Soybean variety/trait injury from simulated dicamba drift in Manhattan, KS.

Variety/Trait	Timing	4 Weeks after Exposure	September 10
		(% injury)	
Credenz 3841 LL	V3	31	8
	R1	50	69
Credenz 4746 LL	V3	28	5
	R1	55	51
Asgrow AG 4135 RR2	V3	31	5
	R1	54	66
Stine 40BA02	V3	32	10
	R1	64	74
Lsd (5%)		3	5

Despite differences in dicamba injury among varieties, soybean yield effects were not different among varieties. Soybean yields varied among varieties, with the later maturity variety yielding higher than the other varieties (Table 6). Soybean yield was not reduced from dicamba exposure at the V3 timing and was actually slightly higher than the untreated check. Soybean

Yields from dicamba exposure at the R1 stage was reduced 23% compared to the untreated check, similar to the results from the other experiment.

Table 6. Soybean variety/trait* response from simulated dicamba drift (1/100X) at Manhattan, KS.

Dicamba Treatment	Soybean Yield	Yield Loss
	(Bushels/Acre)	(%)
Untreated	35	-
V3	37	+6
R1	27	23
Lsd (5%)	2	7

* No significant differences among varieties.

Grain harvested from both experiments had extremely poor quality due to early season drought stress and delayed harvest as a result of excess moisture in the fall at harvest time. Consequently, seed viability was very low, highly variable, and not different among treatments. The experiments will be repeated in 2019 at Manhattan and Ottawa, KS. The second field site will be relocated from Hays to Ottawa due to ongoing concerns with drift from outside the experimental area at Hays.