Texas Cooperative EXTENSION
The Texas A&M University System

Effects of Simulated Glyphosate Drift on Grain Sorghum Growth

Texas Agricultural Experiment Station (2001)
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Summary
Glyphosate applied at various drift rates and at various stages of growth inhibited grain sorghum development and yield. Applications made to 12 inch grain sorghum appeared to be the most detrimental while post-flower applications had the least amount of negative impact. Significant yield reduction began to appear at rates above 4 oz/ac in nearly every growth stage. Applications of 16 oz/ac, which could be considered a full-rate, usually resulted in greater than 70% crop death.

Objective
As Roundup Ready crops continue to become an increasing part of weed control strategies for corn, cotton, and soybean producers, the threat of off-target drift onto crops such as grain sorghum also becomes of increasing concern. When drift happens, determining how much injury has occurred and ultimately how much yield reduction will potentially occur is very difficult. Therefore, this study was established at the Texas Ag Experiment Station at Bushland to help answer these questions by applying various simulated drift rates to grain sorghum at different growth stages. Finally, these data will serve as a guide to producers and consultants as to how much yield loss can be expected so they can adjust future inputs to a crop which may not reach potential yield or may need to be totally abandoned.

Materials and Methods

Design:	Randomized Complete Block
Plot Size:	15' wide x 25' long
Crop Variety:	Pioneer 8699
Planting Date:	June 4, 2001
Application Dates:	June 12, June 30, July 18, August 7
Crop Stages:	2 leaf, 12 inch, boot, post-flower
Temperature (F):	101, 88, 81, 76
Humidity (%):	24, 34, 48, 40

Applications were made using either a tractor mounted or hand held CO_2 sprayer calibrated for output of 10 gallons per acre. Ratings for crop injury were taken at 2 and 4 weeks after treatment (WAT). Injury was rated as percentage of crop death or visual growth reduction as compared to an untreated check. A rating of 0 would equal no injury while a rating of 100 would equal complete crop kill. Height in centimeters was also recorded for each plot at flag-

leaf to further measure growth inhibition. Heights were taken at flag-leaf to ensure consistency. At maturity each plot was harvested for yield comparison against the untreated check.

Results

Effect of simulated glyphosate drift on grain sorghum growth.

Application Timing (Growth Stage)	Glyphosate Rate (oz/ac)	Injury 2 WAT (%)	Injury 4 WAT (%)	Crop Height (cm)	Crop Height (% of check)	Crop Yield (lbs/ac)	Crop Yield (% of check)
2 Leaf	1	0 g[1]	0 g	61 bcd	87	7495 a	108
2 Leaf	2	0 g	0 g	62 bc	89	6582 abc	94
2 Leaf	4	7 f	8 f	64 b	91	7329 a	105
2 Leaf	8	62 c	63 c	57 de	83	6057 bc	87
2 Leaf	16	83 a	88 a	56 ef	80	1659 e	24
12 Inch	1	0 g	0 g	70 a	100	6873 ab	99
12 Inch	2	3 fg	3 fg	69 a	99	6900 ab	99
12 Inch	4	23 e	20 e	59 cde	84	5393 c	77
12 Inch	8	60 c	75 b	35 h	50	2890 de	42
12 Inch	16	75 b	90 a	36 h	51	97 f	1
Boot	1	0 g	0 g	64 b	91	6831 ab	98
Boot	2	3 fg	3 fg	63 bc	90	6430 abc	92
Boot	4	18 e	18 e	58 de	83	6347 abc	91
Boot	8	45 d	45 d	53 fg	76	3429 d	49
Boot	16	73 b	73 b	49 g	70	83 f	1
Post-Flower	1	0 g	0 g	63 b	90	6748 ab	97
Post-Flower	2	0 g	0 g	62 bc	89	6471 abc	93
Post-Flower	4	0 g	0 g	64 b	91	6637 abc	95
Post-Flower	8	18 e	20 e	62 bc	89	6264 abc	90
Post-Flower	16	47 d	47 d	64 b	96	3388 d	49
Check	-	-	-	70 a	100	6969 ab	100

[1] Data numbers followed by the same letter(s) are not statistically different (P=0.05).

Discussion
At the 2 leaf stage it took at least 4 oz/ac of glyphosate to cause visual injury. Height was also reduced at this rate but yield was not affected. The 8 oz rate caused significant injury and ultimately reduced yield by 13% while the 16 oz rate reduced yield by 76%. Twelve inch grain sorghum appeared to be the most susceptible to drift. At this stage it only took a 2 oz rate to cause injury, though yield was hardly reduced. Compared to 2 leaf grain sorghum, 4 ounces applied to 12 inch sorghum caused over 20% injury and ultimately a 23% yield reduction. Eight and 16 oz/ac reduced yield by 58 and 99%, respectively. The boot stage was more susceptible than the 2 leaf stage but less susceptible than the 12 inch stage. Four oz applied at boot reduced yield by 9% compared to 23% for the 12 inch stage. At boot, 8 and 16 oz/ac caused comparable yield reduction to sorghum in the 12 inch stage. Applications made at the post-flower stage appeared to have the least amount of negative effect on grain sorghum. At this stage it took at least 16 oz/ac to significantly reduce yield as compared to the untreated check.

These data show that the 12 inch stage of grain sorghum is the least tolerant to drift rates of glyphosate while drift occurring at the post-flower stage causes the least amount of damage. At 2 leaf through boot it commonly took a rate of at least 4 oz/ac to cause significant injury and yield reduction. Ultimately, this set of data will aid producers and consultants in making decisions on drift damaged grain sorghum by linking crop stage and level of injury to potential yield loss.

This study will be repeated in 2002.

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