The University of Georgia
Cooperative Extension
College of Agricultural and Environmental Sciences
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2012 UGA COTTON DEFOLIANT EVALUTION PROGRAM

(Midville Location)

FIELD DESCRIPTION

This trial was conducted at the University of Georgia Southeast Research and Education Center in Midville, GA. The site was an irrigated field planted on June 10, 2012. Crop condition and plant maturity was assessed three days prior to defoliation, on October 31, 2012 (Figure 1). Leaves on most plants were mature and showing signs of senescence (green leaves were common, but most were senescing normally). Leaves on the plant did show symptoms of leaf spot, but defoliation from this disease complex was not prevalent (although some basal defoliation had occurred). There were slight signs of juvenile regrowth in the basal region of the plant, yet field conditions were not likely to promote regrowth (extremely low moisture and low temperatures). There was little to no sign of terminal regrowth in this trial site. There were little to no juvenile reproductive structures in the plant (few or no squares or flowers). Weather conditions during the past few weeks likely "toughened" leaves in this crop, due to little to no rain and heavy winds for several days this week (Figure 1).

Plant growth and maturity information was collected from 30 randomly selected plants in the trial (Figure 1). Cotton height averaged 51 inches, and ranged from 44 to 55 inches. The total number of bolls per plant ranged from 7 to 35, and averaged 20. The percentage of bolls which were open averaged 48% and ranged from 29 to 72%. Nodes above cracked boll ranged from 2 to 7, with an average of 4.6. Examination of unopened bolls indicated most unopened bolls appeared to be sufficiently mature to open with a boll opening defoliant, however a portion of the bolls (near the terminal, on outer fruiting positions, and on vegetative branches) may not have been sufficiently mature (approximately 10 to 20% of the total number of bolls, not of unopened portion). In other words, with approximately 20 bolls per plant in this trial, an average of 10 bolls were open and 10 bolls were unopened, and 6 to 8 of those 10 unopened bolls were sufficiently mature.

Defoliation applications (product selection and rate) were determined by manufacturers and were based on crop condition and weather forecast. Weather conditions on the day of application (Friday 11-2-12) included no chance of rainfall and sunny conditions with a high of 76 and a low of 44. The forecast for the two days following defoliation indicated daytime temperatures reaching the mid to upper 70's and lows in the low 50's. The forecast for the rest of the week following defoliation predicted highs in the mid to upper 60's and lows in the mid 40's. Except for a 30% chance of precipitation on 11-5-12, little to no chance of precipitation was in the forecast.

Figure 1. Images of cotton at trial site taken on October 31, 2012, three days prior to defoliation.

TRIAL DESCRIPTION

Defoliants were applied on the morning of November 2, 2012. All treatments were applied with a Lee Spider High-Clearance Tractor equipped with a 4-row boom with 8002VS flat fan nozzles. It was calibrated to deliver 10 GPA at 5 mph at 40 PSI. The trial consisted of 20 different defoliation application mixtures and two non-treated checks for a total of 22 treatments. Plots consisted of 4 cotton rows approximately 30 feet in length (all four rows of each plot were sprayed). Treatments were arranged in a randomized complete block design with four replications. Visual assessments of percent open boll, percent defoliation, percent desiccation, and percent regrowth were estimated at 7, 14, and 21 days after treatment (DAT). Data were subjected to ANOVA using the PROC MIXED procedure of Statistical Analysis System (SAS). Means were separated with Fisher's Protected LSD at $P \leq 0.10$.

WEATHER PRIOR TO AND FOLLOWING DEFOLIATION

Due to crop maturity and weather conditions during trial evaluations, results should represent late-season defoliant performance. Daytime high temperatures typically remained lower than 80°F and nighttime lows were always below 60° F (Figure 2).

During the first week following defoliation, rainfall events occurred on four and five DAT, totaling less than 0.4" (Figure 4). One additional rainfall event occurred on 13 DAT (approximately 1").

Daytime high temperatures increased to the low 80's up to 3 DAT, fell to the low 50's on 6 and 7 DAT, and generally remained at or below the mid 70's for the rest of the evaluation period. Low temperatures rose slightly immediately after defoliation (reaching the 60's three to six DAT), yet fell over the rest of the evaluation period (down into the low 50's by eight DAT and into the 40's by nine DAT).

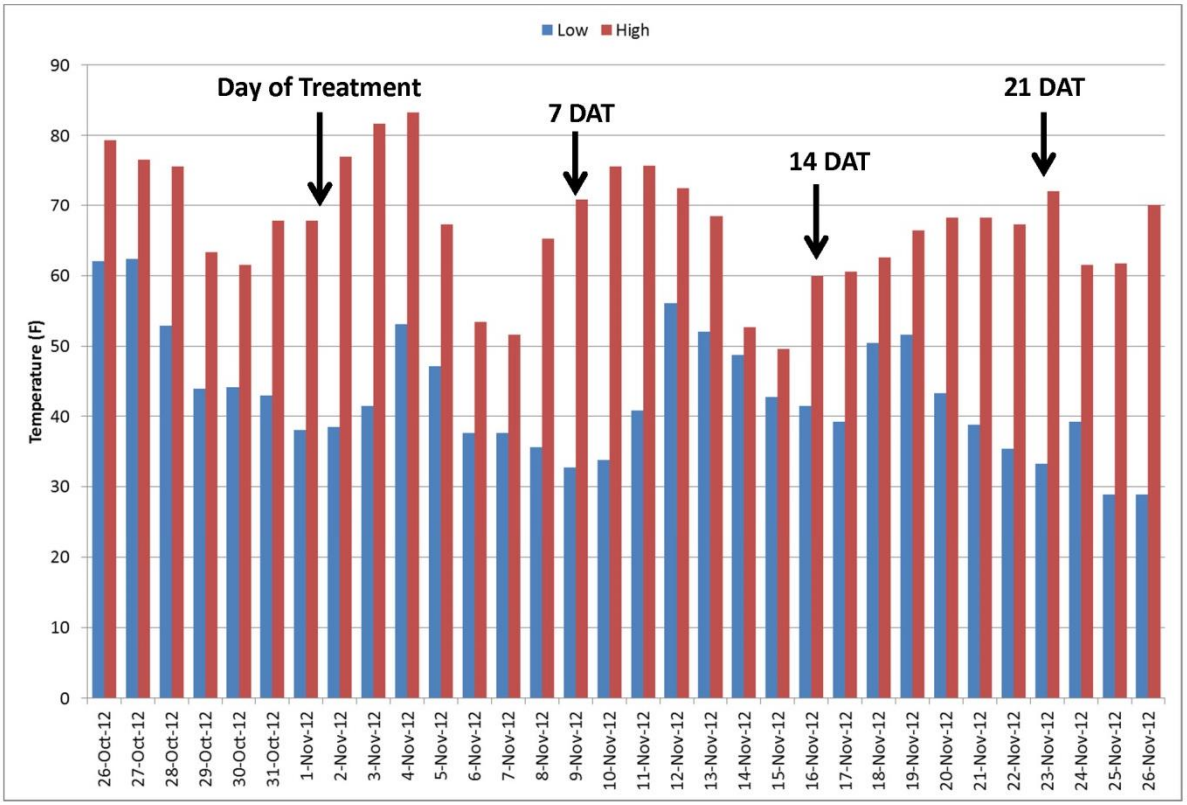

Figure 2. High and low temperatures at the Midville site during the experiment in 2012.

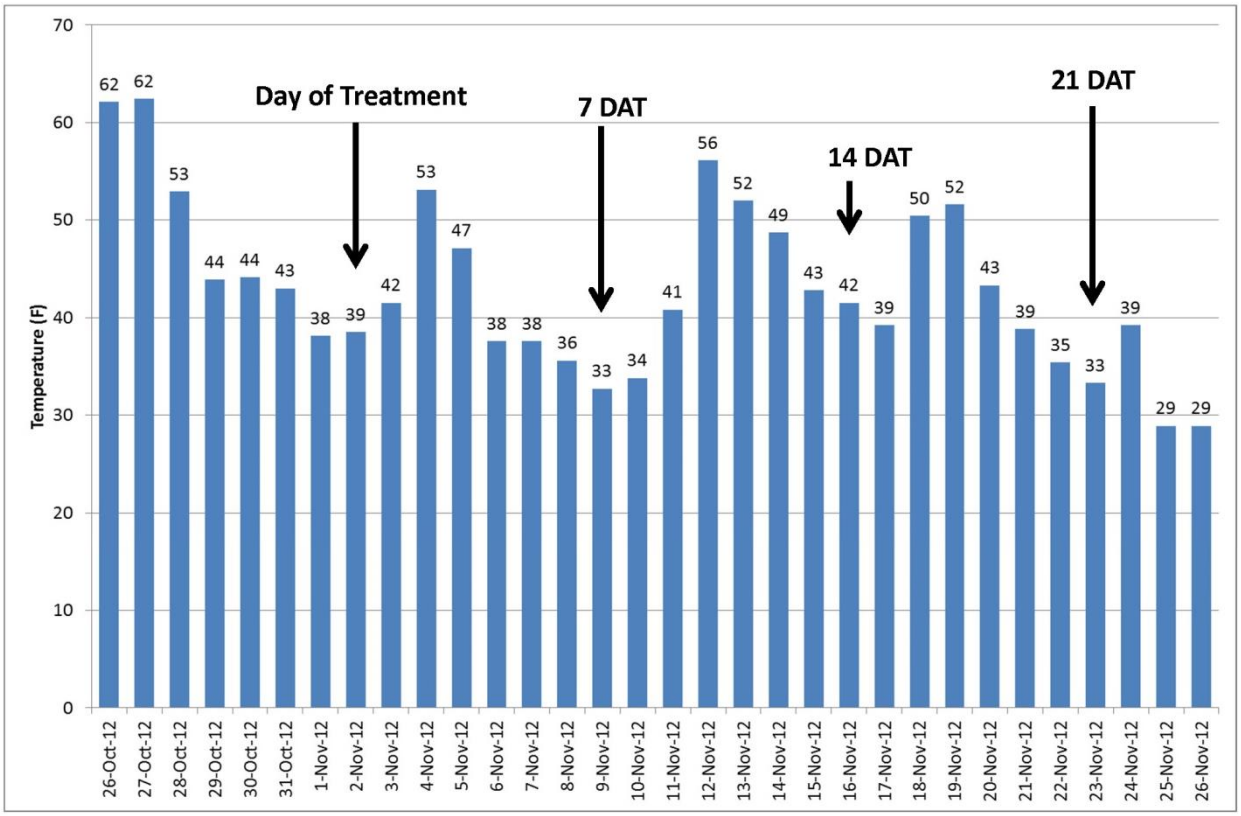

Figure 3. Low temperatures at the Midville site during the experiment in 2012.

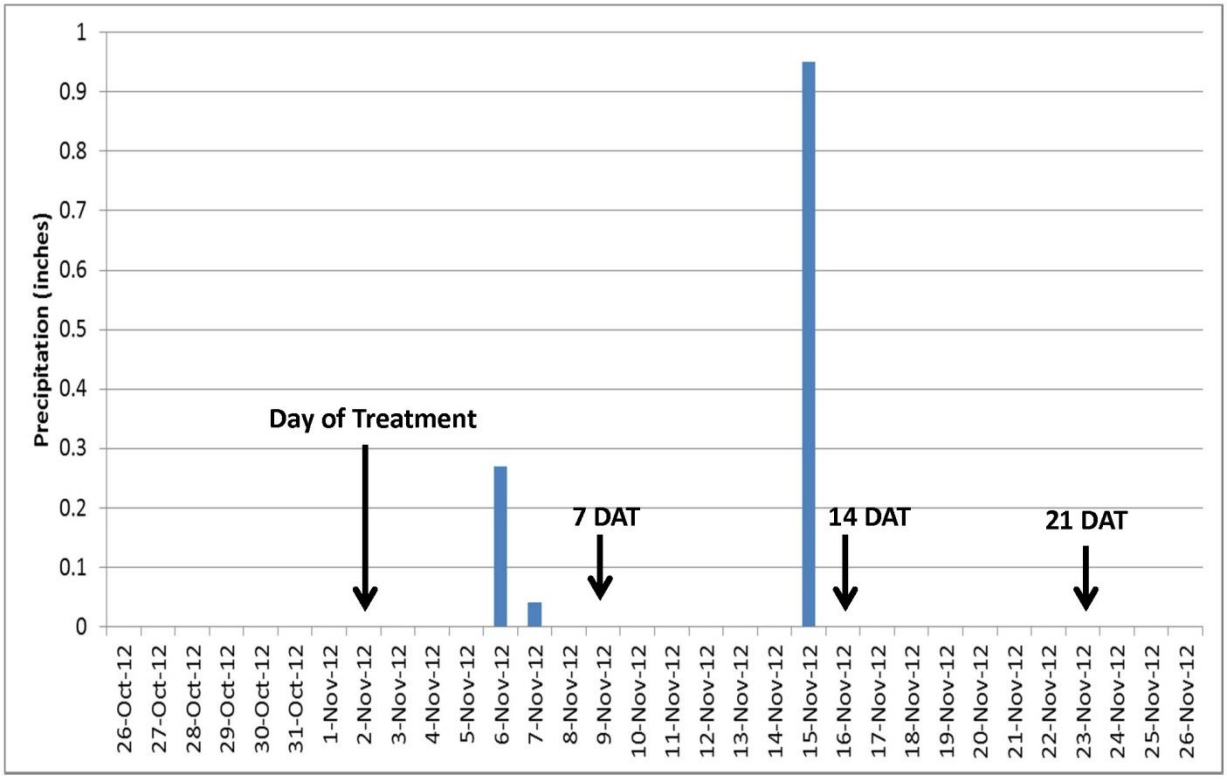

Figure 4. Rainfall events (daily amounts) at the Midville site during the experiment in 2012.

DEFOLIANT PERFORMANCE - Table of Results on Page 6 (Figure 5).

In this trial, the defoliation process was rather slow, likely because of cool temperatures and low soil moisture before and after defoliation. Open boll and defoliation ratings increased at each evaluation, even between 14 and 21 DAT. This trial provides evidence to the variability in results from defoliant applications and the dramatic effect of environment on applications.

Although temperatures from the weather station (less than 1000' feet away from the actual site) did not indicate it, a slight frost occurred on the morning of 11-1-12 and likely further affected the defoliation process. As expected, significant differences in percent open boll was observed where all treatments had a positive benefit over the non-treated check. There were some differences observed between defoliant treatments, especially at 7 and 14 DAT, but all treatments which contained an ethephon product were at least 75 and 95% open by 14 and 21 DAT, respectively. Additionally, treatments without ethephon which contained paraquat also were effective at opening bolls. However, ethephon products have consistently demonstrated the ability to aid in boll opening and are the recommended product for boll opening.

In general, desiccation was highest 7 DAT and was lower at each subsequent rating. At 7 DAT, desiccation was rated at 14% in non-treated plots (from the light frost occurring on 11-1). Some defoliant mixtures increased desiccation, but in general, treatments which contained paraquat had highest desiccation ratings. By 21 DAT, desiccation was rated above 20% in several treatments, yet some defoliant mixtures reduced desiccation below observed levels in non-treated checks.

Due to cool temperatures and little rainfall prior to and following defoliation no regrowth was observed in this trial. In situations where regrowth is likely to occur, thidiazuron products have traditionally been most effective and consistent, especially when applied at rates suggested for regrowth control (typically on the higher end of the use rate spectrum).

The effectiveness of any particular defoliation strategy is very difficult to predict, even among experienced agronomists. The sheer number of products, rates, and potential tank-mixtures also makes specific decisions difficult. This trial demonstrated the effectiveness of 20 defoliation treatments which were tested at this location in these conditions, and although specific differences were noted amongst performances, be aware that each case (crop condition and weather) may result in entirely different results. Therefore, growers should realize that harvest aid performance can be highly variable, unpredictable, and dependent upon crop and environmental conditions at timing of application and thereafter.

Because of the many product, rate, tank-mixture combinations currently available, the ability to identify relative efficacies of products with regards to their ability to remove leaves (mature and/or juvenile), open bolls, and prevent regrowth will greatly help in decision making. Please consult your local UGA County Extension Agent for help in making specific defoliant decisions and for more information on specific defoliant performance.

One additional thing to consider, was not included in this report, is cost. Although performance is the primary parameter from which decisions should be made, the costs of a defoliant mixture should be considered to determine the value of specific products vs. their potential benefit. As always, consult the label of any harvest aid product regarding directions for use, rates, and safety information.

	Treatment	Application Rate	% Open Bolls			% Defoliation			% Dessication			% Regrowth		
			7 DAT	14 DAT	21 DAT	7 DAT	14 DAT	21 DAT	7 DAT	14 DAT	21 DAT	7 DAT	14 DAT	21 DAT
1	ET	1.5 fl oz/a	71 c-g	91 cde	99 ab	55 c-f	65 ef	79 d-g	30 b-f	26 de	23 cd	0 a	0 a	0 a
	ethephon (6 lbs ai/gal)	32 fl oz/a												
	COC	0.5 % v/v												
2	ET	1.5 fl oz/a	71 c-g	89 def	97 ab	61 a-d	70 c-f	84 b-e	24 d-j	23 efg	16 d-h	0 a	0 a	0 a
	ethephon (6 lbs ai/gal)	32 fl oz/a												
	COC	0.5 % v/v												
	thidiazuron (4 lbs ai/gal)	1.6 fl oz/a												
3	CutOut	6.4 fl oz/a	75 bcd	86 ef	98 ab	66 ab	69 def	86 bcd	25 d-i	20 e-i	15 d-h	0 a	0 a	0 a
	SuperBoll	32 fl oz/a												
4	CutOut	8 fl oz/a	66 e-i	90 de	97 ab	50 ef	71 cde	84 b-e	28 c-h	19 f-j	16 d-h	0 a	0 a	0 a
	SuperBoll	32 fl oz/a												
5	Finish 6 Pro	21 fl oz/a	70 d-h	89 ef	97 ab	63 abc	76 abc	91 ab	14 jk	15 h-k	10 hi	0 a	0 a	0 a
6	(private)	5 fl oz/a	71 c-g	75 g	93 cd	50 ef	76 abc	88 abc	14 jk	13 jk	11 ghi	0 a	0 a	0 a
	(private)	8.89 fl oz/a												
7	Ginstar	6.4 fl oz/a	63 hi	70 ghi	96 abc	55 c-f	55 hi	70 hi	33 bcd	24 efg	33 a	0 a	0 a	0 a
8	(private)	6.4 fl oz/a	65 f-i	71 gh	91 d	48 f	66 ef	79 d-g	29 b-g	18 g-j	19 c-g	0 a	0 a	0 a
	(private)	5 fl oz/a												
9	(private)	7.5 fl oz/a	70 d-h	83 f	92 d	68 a	80 ab	95 a	19 g-k	13 jk	6 i	0 a	0 a	0 a
	(private)	8.89 fl oz/a												
10	Folex	12 fl oz/a	74 cde	90 de	96 abc	68 a	74 bcd	90 ab	20 f-k	18 g-j	10 hi	0 a	0 a	0 a
	ethephon (6 lbs ai/gal)	24 fl oz/a												
	thidiazuron (4 lbs ai/gal)	2 fl oz/a												
11	Folex	16 fl oz/a	65 f-i	86 ef	97 ab	60 a-e	69 def	81 c-f	31 b-e	25 def	19 c-g	0 a	0 a	0 a
	ethephon (6 lbs ai/gal)	24 fl oz/a												
	thidiazuron (4 lbs ai/gal)	2 fl oz/a												
12	Display (F9328-1)	0.4 fl oz/a	78 a-d	98 abc	99 a	59 a-e	83 a	91 ab	25 d-i	13 jk	10 hi	0 a	0 a	0 a
	ethephon (6 lbs ai/gal)	24 fl oz/a												
	NIS	0.25 % v/v												
13	Display (F9328-1)	0.6 fl oz/a	74 cde	88 ef	98 ab	62 abc	71 c-f	86 bcd	21 e-k	21 e-h	14 e-i	0 a	0 a	0 a
	ethephon (6 lbs ai/gal)	24 fl oz/a												
	thidiazuron (4 lbs ai/gal)	1.6 fl oz/a												
	NIS	0.25 % v/v												
14	Adios	6.4 fl oz/a	73 c-f	92 b-e	100 a	59 a-e	71 cde	88 abc	18 h-k	19 f-j	13 f-i	0 a	0 a	0 a
	Ethephon 6	32 fl oz/a												
15	Adios	8 fl oz/a	65 f-i	75 g	95 bcd	51 def	65 ef	74 f-i	28 c-h	25 def	25 abc	0 a	0 a	0 a
	Ethephon 6	32 fl oz/a												
16	Adios	6.4 fl oz/a	73 c-f	86 ef	98 ab	50 ef	64 fg	81 c-f	33 bcd	31 cd	23 bcd	0 a	0 a	0 a
	Ethephon 6	48 fl oz/a												
	tribufos (6 lbs ai/gal)	4 fl oz/a												
17	paraquat (2 lbs ai/gal)	8 fl oz/a	83 ab	98 ab	100 a	48 f	58 gh	77 e-h	48 a	43 ab	23 bcd	0 a	0 a	0 a
	NIS	0.25 % v/v												
18	paraquat (2 lbs ai/gal)	8 fl oz/a	79 abc	96 a-d	97 ab	56 b-f	55 hi	80 def	38 abc	36 bc	21 c-f	0 a	0 a	0 a
	Resource	2 fl oz/a												
	NIS	0.25 % v/v												
19	paraquat (2 lbs ai/gal)	8 fl oz/a	78 a-d	99 a	100 a	56 b-f	58 gh	78 efg	25 d-i	43 ab	22 cde	0 a	0 a	0 a
	Resource	3 fl oz/a												
	NIS	0.25 % v/v												
20	paraquat (2 lbs ai/gal)	8 fl oz/a	84 a	99 a	100 a	59 a-e	50 ij	69 i	39 ab	46 a	31 ab	0 a	0 a	0 a
	carfentrazone-ethyl (2 lbs ai/gal)	1 fl oz/a												
	NIS	0.25 % v/v												
21	Non-Treated Control A	----	64 ghi	64 i	80 e	31 g	40 k	71 ghi	15 ijk	9 k	23 cd	0 a	0 a	0 a
22	Non-Treated Control B	----	60 i	65 hi	84 e	35 g	44 jk	70 hi	13 k	14 ijk	20 c-f	0 a	0 a	0 a
	LSD (P=0.10)		7.6	7	3.8	10.5	7.4	7.6	11.1	6.3	8.4	0	0	0

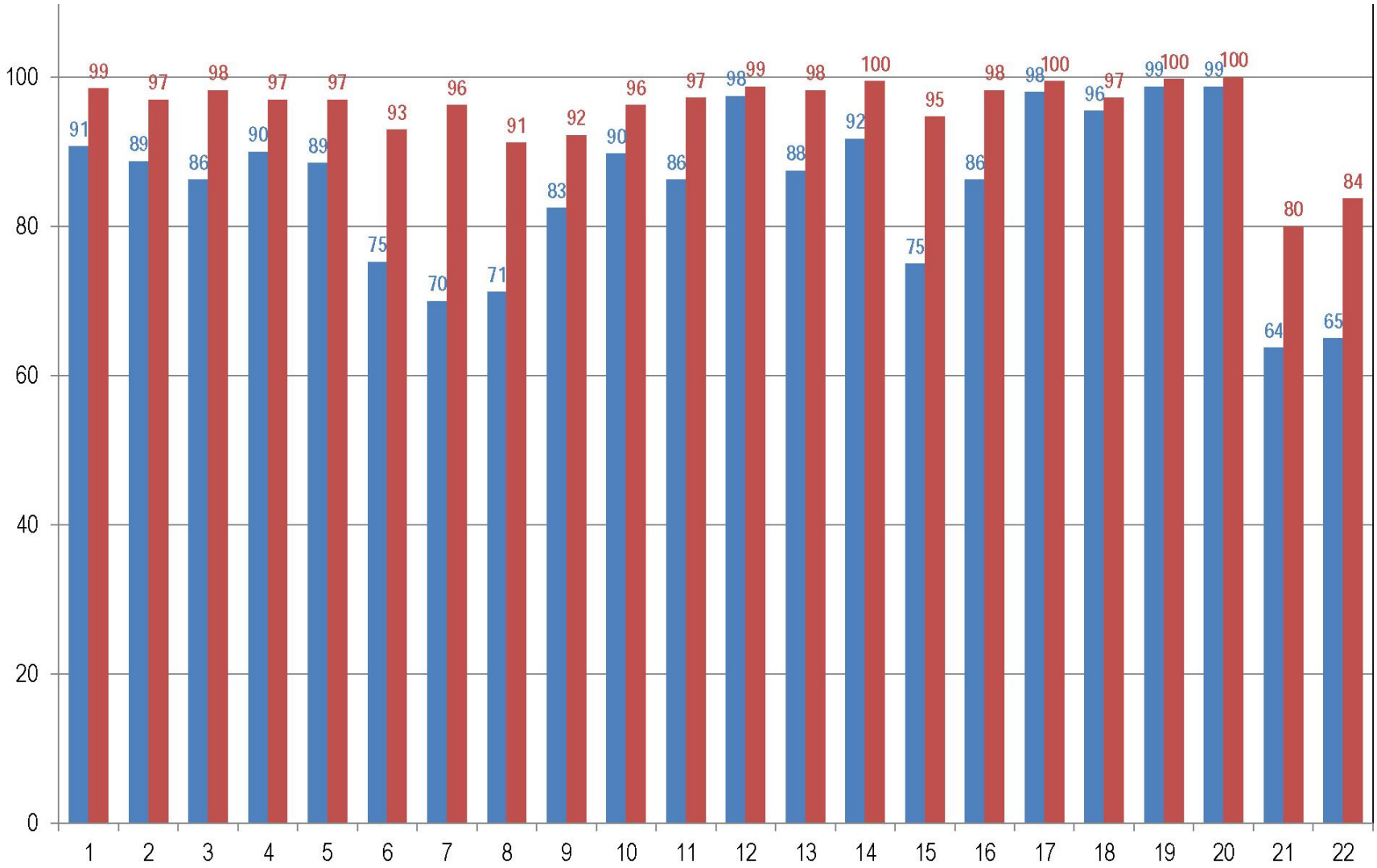

Figure 6. The chart above illustrates percent open boll ratings from the Midville location at 14 and 21 DAT (14 DAT – blue bars, 21 DAT – red bars). Use information from table on page 6 for treatment description for numbers listed on X-axis. LSD (p=0.10) is 7.0 and 3.8 for 14 and 21 DAT data, respectively.

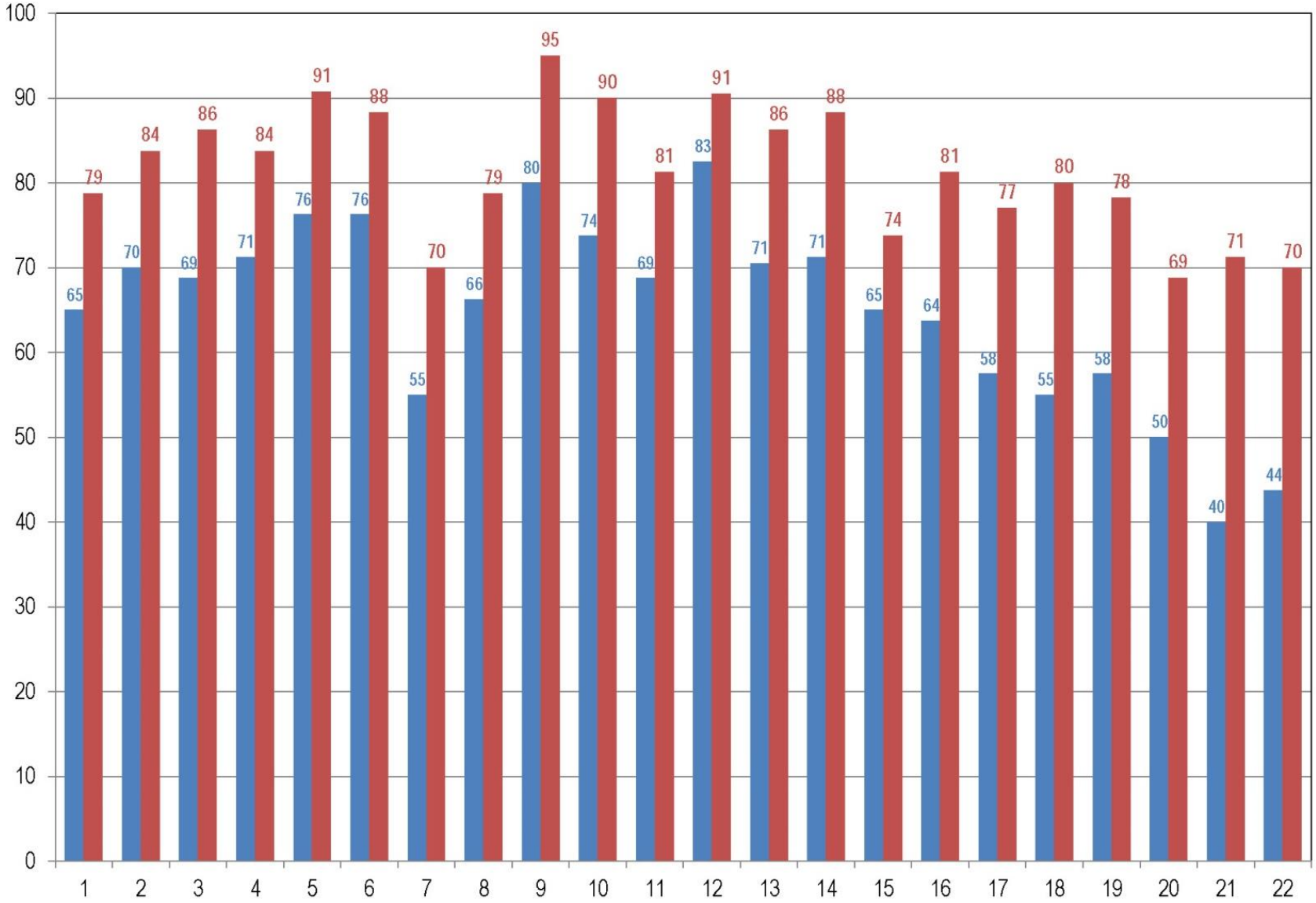

Figure 7. The chart above illustrates percent defoliation ratings from the Midville location at 14 and 21 DAT (14 DAT – blue bars, 21 DAT – red bars). Use information from table on page 6 for treatment description for numbers listed on X-axis. LSD (p=0.10) is 7.4 and 7.6 for 14 and 21 DAT data, respectively.

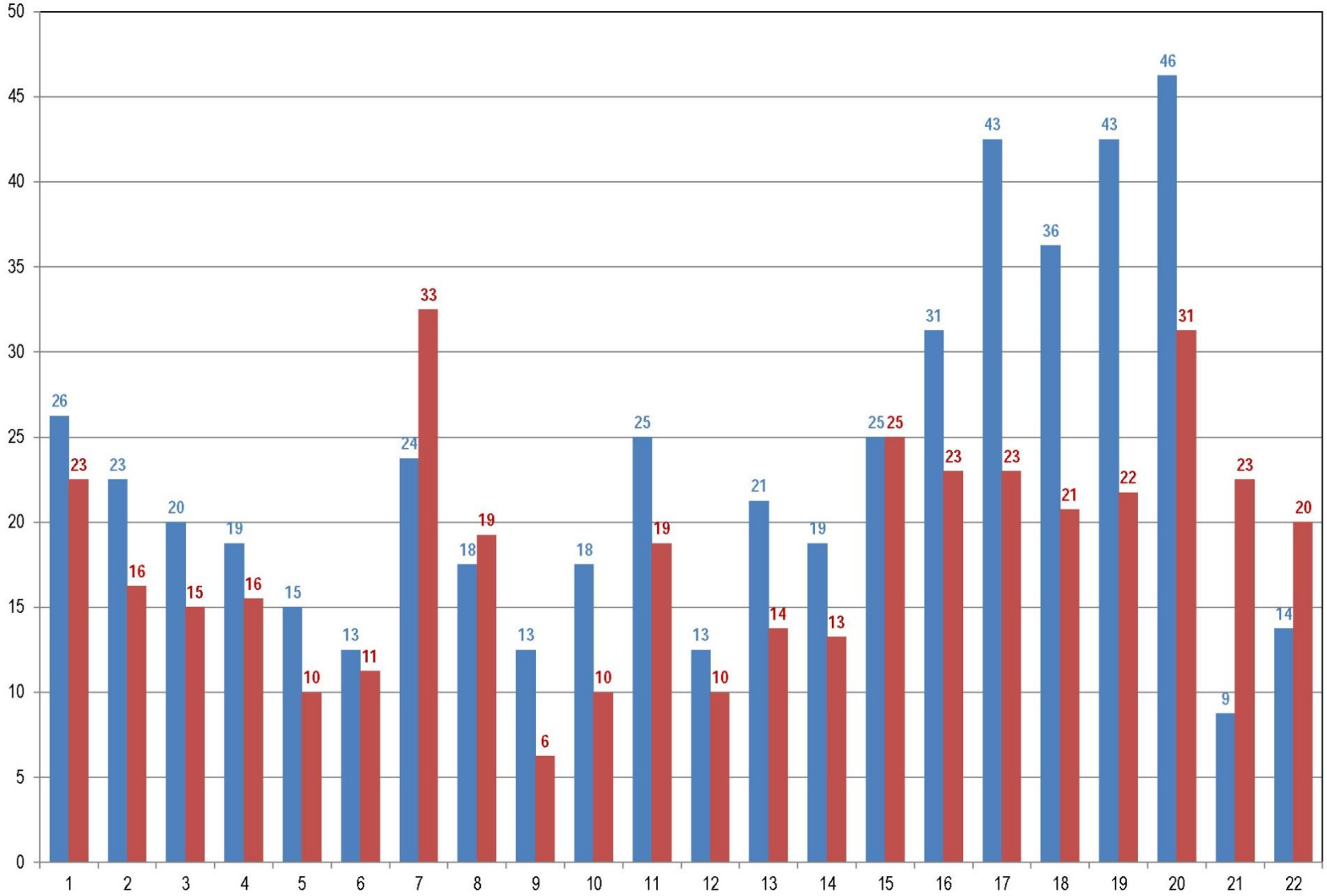

Figure 8. The chart above illustrates percent desiccation ratings from the Midville location at 14 and 21 DAT (14 DAT – blue bars, 21 DAT – red bars). Use information from table on page 6 for treatment description for numbers listed on X-axis. LSD (p=0.10) is 6.3 and 8.4 for 14 and 21 DAT data, respectively.

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