BERMUDAGRASS RESPONSE TO GLYPHOSATE

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Twenty bermudagrass biotypes collected from sugarcane fields and from non-sugarcane producing areas in Louisiana (Table 1) were grown at the Central Research Station, Ben Hur Research Farm, Baton Rouge, LA. Seventy nine days after planting on August 11, 2011, bermudagrass biotypes ranging in height from 3 to 12 inches were treated with glyphosate at 2 lb/A (equivalent to 64 oz/A rate of a 4L formulation and 46 oz/A of a 5.5L formulation). The biotypes were divided into three groups based on similarity in control. Seven days after treatment (DAT) with glyphosate control averaged 49% for the Group 1 biotypes (A, E, N, R, and S) compared with 89% for the Group 3 biotypes (B, F, G, H, I, L, P, and T) (Table 2). Control at 14 DAT averaged 86 and 98% for the Group 1 and Group 3 biotypes, respectively. Control of Group 2 biotypes (C, D, J, K, M, and Q) averaged 95% and was equivalent to that for the Group 3 biotypes. Control 28 DAT was at least 99% for the three biotype groups. On June 26, glyphosate at 2 lb/A was applied to bermudagrass planted the previous year when plant height of the biotypes ranged from 5 to 14 inches. Using the same biotype groupings as for the previous year, control 7 DAT with glyphosate was no more than 18% (Table 2). By 14 DAT the Group 1 and Group 3 biotypes were controlled 19 and 30%, respectively. Control of the three biotype groups 28 DAT was equivalent and ranged from 41 to 52%.

When averaged across the 7, 14, and 28 DAT ratings, bermudagrass control ranged from 71% for biotype R to 99% for biotype F in 2011 and from 17% for biotypes A and C to 38% for biotypes D, F, and P in 2012 (Tables 1 and 3). For the Group 1 biotypes in 2011, average control ranged from 71% for biotype R to 82% for biotypes E and N with a Group average of 78%. In 2012, control of the Group 1 biotypes averaged 24% and ranged from 17% for biotype A to 34% for biotype S. For the Group 2 biotypes, bermudagrass control was lowest for biotype C in 2011 (84%) and in 2012 (17%) and was greatest for biotype M in 2011 (89%) and for biotype D in 2012 (38%). Averaged across Group 2 biotypes, control in 2011was 86% and in 2012 was 27%. In both years, average control of the Group 2 biotypes was greater than for the Group 1 biotypes. For the Group 3 biotypes, bermudagrass control was lowest for biotypes B and L (93%) in 2011 and for biotype T (19%) in 2012. Bermudagrass control for the Group 3 biotypes was greatest for biotype F in 2011 (99%) and for biotypes F and P in 2012 (38%). Averaged across Group 3 biotypes, bermudagrass control was 96% in 2011 and 34% in 2012 and for both years, control was greater than for Groups 1 and 2. To further evaluate control, bermudagrass foliage both years was removed following the 28 DAT rating and bermudagrass regrowth was determined 28 days later based on percent ground cover within each plot. In 2011, regrowth was not observed for any of the biotypes indicating that glyphosate rate was sufficient to provide complete control that year (data not shown). In 2012 bermudagrass regrowth was observed for all biotypes and was greatest for biotypes A, C, J, Q, S, and T (66 to 86% ground cover) and lowest for biotypes D, F, L, M, P, and R (2 to 19% ground cover) (Table 3).

Bermudagrass biotypes least sensitive to glyphosate based on lowest control averaged across 7, 14, and 28 DAT ratings for both years and for greatest regrowth in 2012 (Table 3) would include A (St. Martinville), C (Baldwin), J (Samuels), and Q (Port Allen). Biotypes most

sensitive to glyphosate based on greatest control both years and least regrowth would include D (Centerville), F (Vacherie), M (Bunkie), and P (Paterson). Although bermudagrass biotypes evaluated in this study do not represent all of the possible genetic variability in bermudagrass in Louisiana, they are representative of bermudagrass fields where sugarcane has been grown for more than 80 years and at sites where crops other than sugarcane have been grown. Differences in sensitivity to glyphosate observed in this study may help to explain the variation in bermudagrass control with glyphosate observed in fallowed fields in the sugarcane producing area of Louisiana.

Results showed that glyphosate was most effective when applied to bermudagrass during early establishment. In sugarcane fields after several years of production, bermudagrass can become well established. It would be critical during the fallow period that intensive tillage programs that fragment bermudagrass stolons and rhizomes be implemented prior to glyphosate application. Glyphosate should be applied when stolon growth is first initiated and before stolons begin to root and spread. A tillage operation 7 to 10 days following application along with one or more follow-up applications of glyphosate, as needed, should help to improve long-term bermudagrass control.

Table 1. Bermudagrass biotypes collected in Louisiana and evaluated for control with glyphosate.[a]

Biotype	Grower	Farm	Location	Parish
		Outfield sites [b]		
A	Lawrence Levert	St. John	St. Martinville	St. Martin
B	Ronald Hebert	Ronald Hebert	Jeanerette	Iberia
C	Brett Allain	Allain	Baldwin	St. Mary
D	Wilson Judice	Frank Martin	Centerville	St. Mary
E	Pete Lanaux	Lanaux	Lucy	St. John the Baptist
F	Brian Graugnard	Bon Secour	Vacherie	St. James
G	Joel Landry	Glenwood	Napoleonville	Assumption
H	Howard Robichaux	Mary	Raceland	Lafourche
I	Danny Naquin	Magnolia	Schriever	Terrebonne
J	Joe Beard III	Brunswick	Samuels	Point Coupee
K	Todd Andre	Alma	Allon	Point Coupee
L	Al Landry	Landry Farm	Plaquemine	Iberville
		Off-Station nursery site[b]		
M	Blake Newton	Bunkie	Bunkie	Avoyelles
		Other sites[b]		
N	Ronnie Gonsulan	Airport Road	New Iberia	Iberia
O	Ronald Hebert	Bayside	Jeanerette	Iberia
P	Mike Cremaldi	Cremaldi Farms	Patterson	St. Mary
Q	Kerny Gros	Barrowza Plantation	Port Allen	West Baton Rouge
R	LSU AgCenter	Sugar Research Station	St. Gabriel	Iberville
S	LSU AgCenter	Dean Lee Research Station	Alexandria	Rapides
T	LSU Agcenter	Northeast Res. Station	St. Joseph	Tensas

[a] Biotype O was not evaluated because of the inability to establish.

[b] Outfield sites are locations where sugarcane cultivar trials are conducted by the LSU AgCenter, USDA, and the American Sugarcane League. The off-station nursery site is used for sugarcane cultivar seed increase. Other sites included sugarcane farms where bermudagrass control concerns have been expressed. Collections were also made at three LSU AgCenter Research Stations where crops other than sugarcane are grown.

Table 2. Control of bermudagrass biotypes 7, 14, and 28 days after treatment (DAT) with glyphosate at 2 lb/A.[a]

Biotype group[b]	2011 Bermudagrass control (%)[c]			2012 Bermudagrass control (%)[c]		
	7 DAT	14 DAT	28 DAT	7 DAT	14 DAT	28 DAT
1	49 f[d]	86 d	99 a	11 f	19 d	41 ab
2	65 e	95 bc	100 a	14 e	24 cd	44 a
3	89 cd	98 ab	100 a	18 d	30 bc	52 a

[a] Two established bermudagrass plants for each biotype were planted in the center of each 5 x 5 foot plot 2 foot from one another on May 23, 2011. Glyphosate was applied on August 11, 2011 when height ranged from 3 to 12 inches. In 2012 glyphosate was applied on June 26 to bermudagrass that had not been treated the previous year and height ranged from 5 to 14 inches.
[b] Grouping of biotypes was based on similarity in response to glyphosate. Group 1 was represented by biotypes A, E, N, R, and S; Group 2 included biotypes C, D, J, K, M, and Q; Group 3 included biotypes B, F, G, H, I, L, P, and T (see Table 1 for information on bermudagrass biotypes and Table 3 for individual biotype response to glyphosate averaged across 7, 14, and 28 DAT).
[c] Control based on a scale of 0 to 100% with 0 = no control and 100% = plant death.
[d] Biotype group means within each year for the 7, 14, and 28 DAT ratings followed by the same letter are not significantly different ($P \leq 0.05$).

Table 3. Control of bermudagrass biotypes averaged across ratings made at 7, 14, and 28 days after treatment with glyphosate at 2 lb/A and regrowth based on ground cover.[a]

Bermudagrass biotype - group	2011 Control (%)[b]	2012 Control (%)	Bermudagrass biotype - group	2012 Regrowth (%)[b]
A - Group 1	79 def[c]	17 e	A - Group 1	66 ab[b]
E - Group 1	82 cdef	28 abcde	C - Group 1	86 a
N - Group 1	82 cdef	22 de	J - Group 1	78 a
R - Group 1	71 f	24 de	Q - Group 1	79 a
S - Group 1	77 ef	34 abc	S - Group 1	79 a
Group 1 average	78 C[d]	24 C	T - Group 1	85 a
			Group 1 avg	79 A
C - Group 2	84 bcdf	17 e		
D - Group 2	88 abcde	38 a	B - Group 2	52 abc
J - Group 2	85 abcde	23 de	E - Group 2	30 abc
K - Group 2	88 abcde	28 abcde	G - Group 2	43 abc
M - Group 2	89 abcde	37 ab	H - Group 2	48 abc
Q - Group 2	85 abcdef	25 cde	I - Group 2	37 abc
Group 2 average	86 B	27 B	K - Group 2	38 abc
			N - Group 2	46 abc
B - Group 3	93 abc	36 abc	Group 2 avg	42 B
F - Group 3	99 a	38 a		
G - Group 3	98 a	26 bcde	D - Group 3	2 e
H - Group 3	95 abc	31 abcd	F - Group 3	4 de
I - Group 3	96 abc	31 abcd	L - Group 3	19 bcd
L - Group 3	93 abcd	25 de	M - Group 3	18 bcd
P - Group 3	97 ab	38 a	P - Group 3	5 de
T - Group 3	95 abc	19 e	R - Group 3	15 cd
Group 3 average	96 A	34 A	Group 3 avg.	11 C

[a] See Table 1 for information on bermudagrass biotypes. Two established bermudagrass plants for each biotype were planted in the center of each 5 x 5 foot plot 2 foot from one another on May 23, 2011. Glyphosate was applied on August 11, 2011 when height ranged from 3 to 12 inches. In 2012 glyphosate was applied on June 26 to bermudagrass that had not been treated the previous year and height ranged from 5 to 14 inches. Grouping of biotypes was based on similarity in response to glyphosate.

[b] Control based on a scale of 0 to 100% with 0 = no control and 100% = plant death. Control data averaged across rating made 7, 14, and 28 days after treatment for glyphosate. Grouping of biotypes was based on similarity in response observed for control in 2011 and the same grouping was also used for 2012. At the 28 day rating bermudagrass biomass was removed and 28 days later regrowth ratings were made based on groundcover of plots where 0 = no regrowth and 100% = total ground cover. Regrowth was not observed for any of the biotypes in 2011.

[c] Biotype means within each column followed by the same lower case letter are not significantly different ($P \leq 0.05$).

COMPARISON OF BERMUDAGRASS GROWTH DURING FALL, WINTER, AND SPRING

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Twenty bermudagrass biotypes collected from sugarcane fields and from non-sugarcane producing areas in Louisiana (Table 1) were grown at the Central Research Station, Ben Hur Research Farm, Baton Rouge, LA. Bermudagrass was planted May 23, 2011, and biomass was harvested on August 25, 2011 and April 25, 2012. Beginning December 1 in 2011 and 2012 and continuing until March 1, 2012 and 2013, bermudagrass biotypes were rated for presence of green foliage to evaluate response to temperature changes as plants entered the winter dormant period and as plants initiated new growth in spring. Ratings were made every 15 days using a scale of 0 to 100%, where 0 = no green foliage and 100 = total area of plot with green foliage. In 2011, the first freeze (ambient temperature of 32 F or less) occurred on November 11 and by February 15, 2012, 15 additional freeze days were recorded (Table 2). In the second year of the study a freeze occurred on November 25, 2012, and three additional freeze days were recorded by February 1, 2013. Additional freezes occurred on March 2, 3, and 27, 2013.

Based on similarities in percent green foliage on December 1, 2011, bermudagrass biotypes were separated into three groups. Percent green foliage on December 1 ranged from 92 to 99% for the Group 1 biotypes (A, J, K, N, Q, S, and T), from 82 to 89% for the Group 2 biotypes (B, C, E, F, H, L, P, and R), and from 63 to 78% for the Group 3 biotypes (D, G, I, and M) (Tables 1 and 3). On December 1, 2012, biotypes ranging from 80 to 88% (A, E, K, L, and S) were assigned to Group 1 while biotypes ranging from 63 to 78% (B, C, D, G, H, I, J, M, N, Q, and R) and 40 to 50% (F, P, and T) were assigned to Groups 2 and 3, respectively. For both the 2011/2012 and 2012/2013 time periods the group designations were maintained and used for comparisons of subsequent percent green foliage evaluations.

For the 2011/2012 time period for the Group 1 biotypes, percent green foliage averaged 95% on December 1, 2011, 72% on December 15, 2011, and 11% on January 1, 2012, but was only 1% on January 15 (Table 4). Percent green foliage on December 1, 2011, for the Group 2 biotypes averaged 85%, which was less for the Group 1 biotypes but was greater than the 73% average observed for the Group 3 biotypes. On December 15, 2011, percent green foliage for the Group 2 and 3 biotypes averaged 30 and 10%, respectively. A freeze was observed 4 days during the November 1, 2011 through December 1, 2012 time period (Table 2). From December 2 to December 15, 2011, a freeze was noted 4 days. Between January 2 and February 15, 2012, seven freeze days were noted (Table 2). On January 1 and January 15, 2012, percent green foliage for the three biotype groups averaged no more than11%. New growth of bermudagrass was present on February 1, 2012, and percent green foliage for the three biotype groups was equivalent and ranged from 48 to 51% (Table 4). Percent green foliage was also equivalent for the three groups on February 15 (64 to 73% green foliage) and on March 1, percent green foliage for Group 3 biotypes averaged 87%; less than for the Group 1 biotypes (96%) but equal to the Group 2 biotypes (93%). A freeze was not observed after February 15, 2012 (Table 2).

For the 2012/2013 time period, percent green foliage for Group 1 biotypes averaged 86% on December 1, 2012 and 51% on December 15, 2012 (Table 5). Percent green foliage for the Group 2 and 3 biotypes averaged 73 and 46%, respectively and on December 1 and on December 15 averaged 28 and 11%, respectively. Between November 1 and December 15, 2012, a freeze was noted for only one day (Table 2). Green foliage percentage on January 1, 2013, was 18% for the Group 1 biotypes and was greater than for the Group 2 and 3 biotypes (no more than 6%) (Table 5). During the December 16 and January 1, 2013 time period two freeze days were noted (Table 2). For the January 15 and February 1, 2013, rating dates percentage green foliage was no more than 6% for any of the biotype groups. For the February 1 rating, percent green foliage was considerably less than observed the previous year (Table 4). Percent green foliage observed February 15, 2013 was no more than 39% and no more than 65% on March 1. The lack of regrowth reflected in lower percentage of green foliage in 2013 for the February through March 1 period can be attributed to the two freezes that occurred between March 2 and March 15, 2013 and one that occurred between March 16 and April 1, 2013 (Table 2). Although biotypes differed between years in response to cool weather in the fall, all bermudagrass biotypes exhibited significant regrowth by February 15 each year (Tables 4 and 5).

Averaged across the December, 2011 through March, 2012 time period, percent green foliage for the seven biotypes in Group 1 ranged from 51% for biotype T to 65% for biotype S with an average of 56% (Tables 1 and 6). For the Group 2 biotypes, average percent green foliage was 48% and less than for the Group 1 biotypes. Percent green foliage for the Group 3 biotypes ranged from 34 to 44% and averaged 41%, less than for the other groups. Averaged across the December, 2012 through March, 2013 time period, percent green foliage for the biotypes in Group 1 ranged from 29% for biotype L to 51% for biotype E with an average of 38% for the five biotypes (Tables 1 and 6). Percent green foliage for the Group 2 biotypes ranged from 18% for biotype C to 35% for biotypes G, H, and Q. The average green foliage percentage for the Group 2 biotypes was 29% and less than for the Group 1 biotypes. For the Group 3 biotypes, average green foliage percentage ranged from 9 to 24% with an average of 18%, which was less than for the Group 2 biotypes.

Findings show that bermudagrass biotypes can vary considerable in response to frost. When eight frosts occurred from November 1 to December 15, 2011, biotypes A (St. Martinville), J (Samuels), K (Allon), N (New Iberia), Q (Port Allen), S (Alexandria), and T (St. Joseph) were least sensitive. When three frosts occurred from November 1 to January 1, 2013, biotypes A (St. Martinville), E (Lucy), K (Allon), L (Plaquemine), and S (Alexandria) were least sensitive. When frost was not received in 2012 after February 16, all biotypes were equally aggressive in initiating regrowth and by March 1 percent green foliage averaged 92%. In contrast in 2013 when three frosts were received after February 16, bermudagrass regrowth for all biotypes by March 1 averaged 55% and as expected was less compared with the previous year. These findings suggest that although bermudagrass biotypes may differ in response to frost during the fall and winter period all biotypes were equally aggressive in initiating regrowth in spring.

In Louisiana, bermudagrass, like sugarcane, enters a winter dormant period following the first killing frost and re-emerges in the spring as soil temperature rises. Optimum germination of sugarcane buds and root development occurs at 86 to 95 F (Ingamells 1989) and sugarcane bud germination is poor below 68 F (Smit 2010). In contrast, optimum regrowth of bermudagrass

from stolons and rhizomes occurs at 68 F (Satorre et al. 1996), but rhizome buds do not sprout below 50 F (Horowitz 1972; Satorre et al. 1996). In the present study, bermudagrass regrowth based on percent green foliage present for the biotypes averaged no more than 3% on January 15 of both years (Tables 4 and 5). For the two-week period prior to January 15, minimum/maximum soil temperature was 44/67 F in 2012 and 43/71 F in 2013 (Table 2). By February 1, 2012, percent green foliage for the biotypes averaged 48 to 51% and during the two-week period prior to February 1 that year minimum/maximum soil temperature was 51/72 F. In contrast, percent green foliage was no more than 6% on February 1, 2013 and although minimum/maximum soil temperature was 43/68 F during the two-week period prior to February 1, a frost was received which set back the bermudagrass. By February 15, percent green foliage averaged 70% in 2012 and 32% in 2013. Maximum soil temperature during the two-week period prior to February 15 was 69 F in 2012 and 66 F in 2013, conducive to regrowth of bermudagrass from stolons and rhizomes, but not conducive to regrowth of sugarcane. Results from this research delineate the importance of implementing management practices such as removal of the previous crop residue and winter weeds and establishment of adequate field drainage to promote warming and drying of sugarcane beds and earlier emergence of sugarcane. Use of soil-applied herbicides to suppress bermudagrass growth can also be beneficial in enhancing crop competition.

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Table 1. Bermudagrass biotypes collected in Louisiana and evaluated for control with glyphosate.[a]

Biotype	Grower	Farm	Location	Parish
		Outfield sites [b]		
A	Lawrence Levert	St. John	St. Martinville	St. Martin
B	Ronald Hebert	Ronald Hebert	Jeanerette	Iberia
C	Brett Allain	Allain	Baldwin	St. Mary
D	Wilson Judice	Frank Martin	Centerville	St. Mary
E	Pete Lanaux	Lanaux	Lucy	St. John the Baptist
F	Brian Graugnard	Bon Secour	Vacherie	St. James
G	Joel Landry	Glenwood	Napoleonville	Assumption
H	Howard Robichaux	Mary	Raceland	Lafourche
I	Danny Naquin	Magnolia	Schriever	Terrebonne
J	Joe Beard III	Brunswick	Samuels	Point Coupee
K	Todd Andre	Alma	Allon	Point Coupee
L	Al Landry	Landry Farm	Plaquemine	Iberville
		Off-Station nursery site[b]		
M	Blake Newton	Bunkie	Bunkie	Avoyelles
		Other sites[b]		
N	Ronnie Gonsulan	Airport Road	New Iberia	Iberia
O	Ronald Hebert	Bayside	Jeanerette	Iberia
P	Mike Cremaldi	Cremaldi Farms	Patterson	St. Mary
Q	Kerny Gros	Barrowza Plantation	Port Allen	West Baton Rouge
R	LSU AgCenter	Sugar Research Station	St. Gabriel	Iberville
S	LSU AgCenter	Dean Lee Research Station	Alexandria	Rapides
T	LSU Agcenter	Northeast Res. Station	St. Joseph	Tensas

[a] Biotype O was not evaluated because of the inability to establish.

[b] Outfield sites are locations where sugarcane cultivar trials are conducted by the LSU AgCenter, USDA, and the American Sugarcane League. The off-station nursery site is used for sugarcane cultivar seed increase. Other sites included sugarcane farms where bermudagrass control concerns have been expressed. Collections were also made at three LSU AgCenter Research Stations where crops other than sugarcane are grown.

Table 2. Minimum and maximum air and soil temperature from November through March at the LSU AgCenter, Ben Hur Research Station, Baton Rouge, LA.

	2011-2012		2012-2013	
	Air temperature	Soil temperature	Air temperature	Soil temperature
Time period	minimum / maximum (C)	minimum / maximum (C)	minimum / maximum (C)	minimum / maximum (C)
Nov 1 – Nov 15	32(1)[a] / 82	53 / 74	36(0) / 83	50 / 80
Nov 16 – Dec 1	31(3) / 78	49 / 74	32(1) / 77	50 / 67
Dec 2 – Dec 15	26(4) / 76	46 / 69	33(0) / 78	45 / 71
Dec 16 – Jan 1	32(1) / 74	48 / 69	29(2) / 77	43 / 67
Jan 2 – Jan 15	25(5) / 75	44 / 67	34(0) / 71	43 / 71
Jan 16 – Feb 1	35(0) / 77	51 / 72	32(1) / 77	43 / 68
Feb 2 – Feb 15	28(2) / 74	47 / 69	36(0) / 75	51 / 66
Feb 16 – Mar 1	39(0) / 78	54 / 71	33(0) / 71	49 / 62
Mar 2 – Mar 15	37(0) / 81	56 / 72	27(2) / 78	45 / 64
Mar 16 – Apr 1	49(0) / 83	62 / 75	30(1) / 81	51 / 68

[a] Data in parentheses represent the number of days during the time period when minimum air temperature was 32 F or less.

Table 3. Percent green foliage for 19 bermudagrass biotypes on December 1 of 2011 and 2012 used to assign grouping of biotypes based on similarity in response.[a]

	Bermudagrass green foliage (%)	
Biotypes	December 1, 2011	December 1, 2012
A	94 (1)[b]	87 (1)
B	84 (2)	75 (2)
C	84 (2)	63 (2)
D	63 (3)	68 (2)
E	88 (2)	87 (1)
F	82 (2)	50 (3)
G	78 (3)	78 (2)
H	86 (2)	76 (2)
I	75 (3)	74 (2)
J	92 (1)	70 (2)
K	92 (1)	88 (1)
L	87 (2)	80 (1)
M	77 (3)	68 (2)
N	94 (1)	75 (2)
P	83 (2)	47 (3)
Q	99 (1)	75 (2)
R	89 (2)	77 (2)
S	99 (1)	86 (1)
T	98 (1)	40 (3)

[a] See Table 1 for information on bermudagrass biotypes.

[b] Green foliage based on 0 - 100%, where 0 = no green foliage and 100 = total area of plot with green foliage. Values in parentheses represent the assigned Group (1, 2, or 3).

Table 4. Percent green foliage assessments every 15 days from December 1, 2011 through March 1, 2012 for bermudagrass biotypes separated into three groups.[a]

Group[b]	Bermudagrass green foliage (%)						
	Dec 1, 2011	Dec 15, 2011	Jan 1, 2012	Jan 15, 2012	Feb 1, 2012	Feb 15, 2012	Mar 1, 2012
1	95 a[c]	72 de	11 j	1 k	48 g	73 e	96 a
2	85 cd	30 hi	4 k	1 k	51 fg	73 e	93 ab
3	73 e	10 ijk	2 k	0 k	48 gh	64 ef	87 bc

[a] Grouping of the biotypes was based on similarity in response for the December 1, 2011 rating (see Table 3). Green foliage based on 0 - 100%, where 0 = no green foliage and 100 = total area of plot with green foliage.

[b] Group 1 represented by biotypes A, J, K, N, Q, S, and T; Group 2 included biotypes B, C, E, F, H, L, P, and R; Group 3 included biotypes D, G, I, and M (see Table 1 for information on bermudagrass biotypes).

[c] Means in columns and rows followed by the same letter are not significantly different ($P \leq 0.05$).

Table 5. Percent green foliage assessments every 15 days from December 1, 2012 through March 1, 2013 for bermudagrass biotypes separated into three groups.[a]

Group[b]	Bermudagrass green foliage (%)						
	Dec 1, 2012	Dec 15, 2012	Jan 1, 2013	Jan 15, 2013	Feb 1, 2013	Feb 15, 2013	Mar 1, 2013
1	86 a[c]	51 cd	18 g	3 jk	6 hij	39 def	65 bc
2	73 b	28 ef	6 hi	1 k	6 ij	31 ef	56 cd
3	46 d	11 ghijk	3 ijk	0 k	3 ijk	25 fgh	43 cde

[a] Grouping of the biotypes was based on similarity in response for the December 1, 2012 rating (see Table 3). Green foliage based on 0 - 100%, where 0= no green foliage and 100 = total area of plot with green foliage.

[b] Group 1 represented by biotypes A, E, K, L, and S; Group 2 included biotypes B, C, D, G, H, I, J, M, N, Q, and R; Group 3 included biotypes F, P, and T (see Table 1 for information on bermudagrass biotypes).

[c] Means in columns and rows followed by the same letter are not significantly different ($P \leq 0.05$).

Table 6. Bermudagrass percent green foliage for nineteen bermudagrass biotypes averaged for assessments made every 15 days from December 1, 2011 through March 1, 2012 and from December 1, 2012 to March 1, 2013 presented individually and by grouping.[a]

Bermudagrass biotype/group	Green foliage (%) 2011/2012	Bermudagrass biotype/group	Green foliage (%) 2012/2013
A – Group 1	55 abcd[b]	A – Group 1	35 bcd
J – Group 1	54 abcde	E – Group 1	51 a
K – Group 1	54 abcde	K – Group 1	32 bcde
N – Group 1	56 abc	L – Group 1	29 cdef
Q – Group 1	60 ab	S – Group 1	43 ab
S – Group 1	65 a	Group 1 average	38 A
T – Group 1	51 bcdef		
Group 1 average	56 A[c]	B – Group 2	31 cde
		C – Group 2	18 fg
B – Group 2	43 efg	D – Group 2	31 cde
C – Group 2	47 cdef	G – Group 2	35 bcd
E – Group 2	48 cdef	H – Group 2	35 bcd
F – Group 2	47 cdef	I – Group 2	26 cdef
H – Group 2	51 bcdef	J – Group 2	24 cdef
L – Group 2	47 cdef	M – Group 2	29 cdef
P – Group 2	48 cdef	N – Group 2	24 cdef
R – Group 1	54 abcde	Q – Group 2	35 bcd
Group 2 average	48 B	R – Group 2	27 cdef
		Group 2 average	29 B
D – Group 3	34 g		
G – Group 3	44 defg	F – Group 3	24 cdef
I – Group 3	41 fg	P – Group 3	21 ef
M – Group 3	44 defg	T – Group 3	9 g
Group 3 average	41 C	Group 3 average	18 C

[a] See Table 1 for information on bermudagrass biotypes. Bermudagrass biotypes planted May 23, 2011. Grouping of the biotypes was based on similarity in response for the December 1, 2011 and December 1, 2012 rating (see Table 3). Green foliage based on 0 - 100%, where 0 = no green foliage and 100 = total area of plot with green foliage.

[b] Biotype means within each column followed by the same lower case letter are not significantly different ($P \leq 0.05$).

[c] For each growth parameter group average means (averaged across several biotypes) followed by the same upper case letter are not significantly different ($P \leq 0.05$).