

Hanna / 140

APPLICATION FOR APPROVAL OF   X   CULTIVARS        ASSOCIATE CULTIVARS  
(Please check appropriate type of application)

1. Crop: Interspecific Hybrid Bermudagrass (Cynodon transvaalensis x C. dactylon)
2. Experimental no. or name: Tested as 93-92, 94-18, 97-4, 00-07, Tift #4 and ST-5.
3. Pedigree and history: In 1992 we crossed six *C. transvaalensis* (T572, T573, T573, T574, T575, T576 and T577) parents with 4 *C. dactylon* (T90, T110, Quickstand, and VaMont) parents at Tifton, GA. Crosses were made in the field by surrounding each *C. transvaalensis* parent with a *C. dactylon* parent in 6-foot square plots. All crosses were in close proximity of each other so we cannot rule out intercrossing between and among plots. On May 7, 1993 we planted on 18 inch centers over 27,700 progenies from the 24 cross combinations. Once established, we mowed the plots 3X per week at ¼ inch. In the fall of 1993 we selected 260 plants (194 were triploid hybrids) that maintained density, color, and tawny mole cricket resistance for further testing. One selection, 93-92, was later tested as 94-18, 97-4, 00-07, and Tift #4 and became ST-5 (ST for shade tolerant). In the fall of 1993, we made a note that ST-5 was a 'nice dwarf'. It has been tested since 1997 in three field and three shade tests at Tifton, GA, in 23 tests in 19 states in the NTEP trials, in one test each in TX and AZ, and in three test for insect resistance at Griffin, GA.
4. Description: In 1993, we classified the selections we made in the fall of 1993 into very dwarf, dwarf and Tifway types. ST-5 was in the dwarf class and therefore our original controls in the 1997 planted test were Tifdwarf and Tifgreen. St-5 is a naturally darker green and dense grass. It produces a small seed head on a thin peduncle in late May and June (typical of bermudagrass, but ST-5 produces slightly more seed heads than desired—the only negative trait of this cultivar). Seed heads can be reduced by 50% by using Primo (data not included).
5. Station(s) where developed: University of Georgia, Tifton Campus
6. Participating scientist(s): Wayne Hanna (USDA-ARS and UGA) and Kris Braman (UGA)
7. In what respect is the new cultivar superior to the cultivar now in use? or reasons for proposing release as an associate cultivar: ST-5 has significantly more shade tolerance than Tifway and TifSport, especially after the first year of establishment (Table 1). Turf quality is as good or better than Tifway and TifSport (Tables 2A, 2B and 6). In most years, ST-5 tends to produce significantly more seed heads than Tifway and TifSport (Table 3), but the number of seed heads can be reduced by treating with Primo (data not shown). Plant color for ST-5 is as good or better than for Tifway or TifSport (Table 4). In field plots where other grass cultivar/genotypes are present ST-5 has significantly better tawny mole cricket resistance than Tifway or TifSport (Table 5). However, in greenhouse studies

under non-preference ST-5 had higher mole cricket reproduction values than did Tifway or TifSport (Table 7B). ST-5 has similar resistance to the two-lined spittle bug (Table 7A) and army worm (Table 8) as Tifway, Tifdwarf and TifSport,, but less resistance to the bermudagrass mite (Table 7A). The bermudagrass mite is mainly a problem on stressed grass.

Note—Data in tables shown for years are usually means of multi-ratings. At Tifton, GA rating are taken monly from April to Oct. At Tifton, GA we do not apply any insecticides, fungicides or herbicides (except for 1 lbs/ac of Atrazine in March). The 'turf quality' rating is a general rating where density, color, texture, pest resistance , etc are considered for evaluating the desirability of the turf.

Additionally, ST-5 has been growing in the following non-replicated shade situations (Table 1B). It has performed well where the shade is not more than 70%. After 70% shade, ST-5 will maintain a turf , but it will thin out as the shade increases. At 95% shade, ST-5 will rate a 3-4 on a scale of 1-9 where 9 is best. Ron Wright at The County Club of Mobile told me he was happy with a rating of 3 or 4 in heavy shade because there was enough sod to keep the soil from eroding, whereas before there was not sod.

1. Lawn in Roswell, GA, 5 years in a lawn (Carter and Amy Burleigh)
2. Rough on Golf Course of Mobile, 3 years in rough (Ron Wright)
3. Lawn in Martinez, GA, 3 years (Aaron and Julie Hanna)
4. Tee on Pinehurst Resort #3, 2 years (Steve Wilson)
5. Rough on Atlanta Athletic Club, 2 years (Ken Mangum and Jason Harris)
6. Rough on East Lake Golf Club, 2 years (Ralph Kepple)

8. Method of propagation: Vegetative (sprigs, plugs, stolons, rhizomes and/or sod)
9. Amount of breeder seed stocks available (if applicable): 12 x 12 feet plot
10. Amount of foundation seed stocks available (if applicable): One acre
11. Amount of cutting or bud material available for vegetatively propagated material for nursery distribution (if applicable):
12. Is there likely to be unusual difficulty encountered in the production of any class of seed stocks? Explain. No

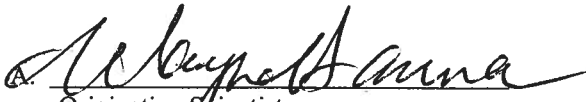
13. Three suggested names for the cultivar: To be determined

14. Name approved by Plant Cultivar and Germplasm Release Committee:

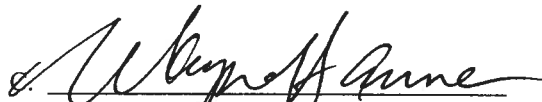
15. Form of intellectual property protection: Plant Patent


16. Is a royalty assessment recommended: X Yes  No

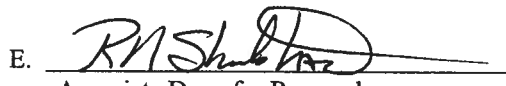
RECOMMENDED BY:

A.   
Originating Scientist

B.   
Department Head

C.   
Chairperson, GAES Plant Cultivar  
and Germplasm Release Committee

D.   
Resident Director  
Appropriate Station

E.   
Associate Dean for Research

F.

APPROVED:

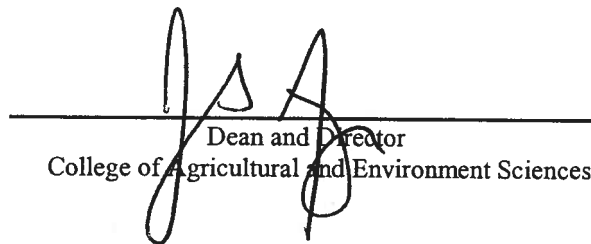
  
Dean and Director  
College of Agricultural and Environment Sciences

Table 1. Response of bermudagrass cultivars to continuous shade.

**Test #1. Planted 1999(64 entries)—under 60% continuous shade.**

Cultivar	Turf Quality	
	1999	
Tifway	4.1	
TifSport	3.9	
Tifgreen	3.6	
Tifdwarf	3.3	
ST-5	5.0	
5%LSD	1.0	

**Test #2-Planted April 2000 (20 entries)-under 60% continuous shade.**

Cultivar	Turf Quality	
	2000	2001
Tifway	5.5	5.3
TifSport	6.0	6.0
ST-5	6.3	7.8
5%LSD	1.6	1.1

**Test #3-Planted May 2002 (7 entries)-under 75% continuous shade.**

Cultivar	Turf Quality		
	2002	2003	2004
Tifway	4.0	4.4	4.5
TifSport	3.8	4.2	4.6
ST-5	6.3	7.8	7.3
5%LSD	1.0	1.1	1.1

Table 1B.		Turf density ratings on ST-5 in non-replicated tests.			
Location	Rating	%Shade	Density (No.Observations)-9=best		
	Dates		ST-5	Tifway	El Toro, Zoysia
<b>Roswell, GA</b>	Nov. 2007	10%	9(3)		
Plt.					
May.2002		50%	8.3(3)		
Yard		60%	8.3(3)		
		95%	3(1)		
<hr/>					
<b>Martinez, GA</b>	July.2007	55%	8(1)		
Plt.					
Mar.2005		85%	4(1)	1(1)	
Yard		60%	7(1)		
		0%	9(1)	8(1)	
<hr/>					
<b>Mobile, AL</b>	June.2007	90%	8(1)	4(1)	
Plt.					
Mar.2005		95%	4(1)	1(1)	
Mobile CC					
<u>Rough.</u>					
<hr/>					
<b>Pinehurst, NC</b>	Sept.2007	90%	8(1)		6(1)
Plt.July.2006		(pine trees)			
Pinehurst #3					
4th Tee					
<hr/>					
<b>Atlanta,GA</b>	Sept. 2007	50%	8(1)		
Plt.					
Sept.2006					
Atlanta Athletic Club					
Rough					
<hr/>					

<b>Atlanta, GA</b>	Sept.2007	70%	7(1)	4(1)
Plt. Sept.				
2006	Little Traffic			
East Lake			3 to	
CC		70%	6(1)	
<i>Rough</i>	High Traffic			

---

Note: %shade reflects the reduction in photosynthesis light in the 450 to 650 wave length range. When appropriate ratings were also made on adjacent standard cultivars.

**Table 2A. Turf quality data on ST-5 triploid turf bermudagrass and standard control cultivars planted in Tifton, Georgia. (9=best quality).**

Cultivar	<u>Turf Quality</u>								
	Mow Ht.	→	1/2 inch	1/4 inch	1/2 inch	1/4 inch	1/2 inch	1/4 inch	1/2 inch
	Year Plant	→	1997	1997	1997	1997	1997	1997	1997
	<u>Data Year</u>	→	<u>1997</u>	<u>1998</u>	<u>1998</u>	<u>1999</u>	<u>1999</u>	<u>2000</u>	<u>2000</u>
Tifgreen			7	5.6	6.7	4.5	4.9	3.4	3.5
Tifdwarf			7.5	6.2	6.6	4.9	4.6	3.3	3.3
Tifway			7.5		6.9		6.3		6.3
TifSport			7.5		6.7		6.7		7.5
<b>ST-5</b>			<b>8.5</b>	<b>7.4</b>	<b>8</b>	<b>6.6</b>	<b>7.2</b>	<b>6.9</b>	<b>6.5</b>
LSD-5%			0.8	0.5	0.5	0.6	0.6	0.8	0.8

Note: In the 1997 planted test, Tifway and TifSport data came from an adjacent test managed identical to the ST-5 test except that it was not mowed at 1/4 inch.

**Table 2A continued:**

Cultivar	<u>Turf Quality</u>							
	Mow Ht.	→	1/2 inch	1/2 inch	1/4 inch	1/2 inch	1/4 inch	1/2 inch
	Year Plant	→	2000	2000	2000	2000	2000	2000
	<u>Data Year</u>	→	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2003</u>	<u>2004</u>	<u>2004</u>
Tifdwarf			6.6	5.3	2.8	3.7	2.9	2.1
Tifway			7.2	7	6.4	7.8	6.1	6.7
TifSport			7.3	6.9	6.2	7	5.6	6.2
<b>ST-5</b>			<b>7.1</b>	<b>6.8</b>	<b>7.9</b>	<b>6.9</b>	<b>6.7</b>	<b>7.7</b>
LSD-5%			0.3	0.2	0.2	0.2	2	1.4



**Table 2B. Turf quality data on ST-5 triploid turf bermudagrass and standard cultivars in Arizona and Texas.**

Cultivar	<u>Turf Quality</u>				
	Mow Ht.	→ 1/4 inch	1/8 inch	3/16 inch	
	Year Plant	→ 1997A	1997T	1997T	
	<u>Data Year</u>	→ <u>1997A</u>	<u>1998T</u>	<u>1998T</u>	
Tifdwarf		4.8	4.2	5.1	
Tifway		5.1	4.5	5.2	
<b>ST-5</b>		<b>6.8</b>	<b>4.9</b>	<b>5.4</b>	
LSD-5%		0.7	0.4	0.6	

Note: Arizona data (A) collected by Charlie Rodgers and Texas data (T) collected by Richard White.

**Table 3. Ratings on seed head formation (end of May and June) on ST-5 and standard controls. (9= many seed heads).**

Cultivar	<u>Seed Heads</u>								
	Mow Ht.	→ 1/2 inch	1/4 inch	1/2 inch	1/4 inch	1/2 inch	1/4 inch	1/2 inch	
	Year Plant	→ 1997	1997	1997	1997	1997	1997	1997	1997
	<u>Data Year</u>	→ <u>1997</u>	<u>1998</u>	<u>1998</u>	<u>1999</u>	<u>1999</u>	<u>2000</u>	<u>2000</u>	
Tifgreen		2.5	1	3	1.7	1	1.2	2	
Tifdwarf		1.5	2	3	2	1.3	1.2	1	
<i>Tifway</i>		2				2.5			
<i>TifSport</i>		1.5				3.8			
<b>ST-5</b>		<b>3.5</b>	<b>3</b>	<b>2.5</b>	<b>3</b>	<b>3.5</b>	<b>2.2</b>	<b>3.3</b>	
LSD-5%		1.6	1.8	1.7	0.7	0.7	1.4	1.4	

Note: In the 1997 planting, Tifway and TifSport data came from an adjacent test managed the same as the ST-5 test except there was not 1/4 inch mowing height.

**Table 3 Continued:**

Cultivar	Seed Heads					
	Mow Ht.	→ 1/2 inch	1/2 inch	1/2 inch	1/4 inch	1/2 inch
	Year Plant	→ 2000	2000	2000	2000	2000
	<u>Data Year</u>	→ <u>2001</u>	2002	2003	<u>2004</u>	<u>2004</u>
Tifdwarf		1.7	3.3	1.3	1.3	1.7
Tifway		2	1.5	1.7	1	3
TifSport		2	1.7	2.3	1.3	3
<b>ST-5</b>		<b>3.8</b>	<b>4.8</b>	<b>3.7</b>	<b>3.7</b>	<b>3.7</b>
LSD-5%		0.2	0.3	0.2	0.8	0.9

**Table 4. Ratings for turf color on ST-5 and standard controls at Tifton, GA and AZ. (9= dark green).**

Cultivar	<u>color</u>					<u>Greenup</u>		
	Mow Ht.	→ 1/4 inch	1/2 inch	1/4 inch	1/2 inch	1/4 inch	1/2 inch	
	Year Plant	→ 1997	1997	1997	1997	1997A	1997	
	<u>Data Year</u>	→ <u>1998</u>	<u>1998</u>	<u>1999</u>	<u>1999</u>	<u>1997A</u>	<u>1998</u>	<u>1998</u>
Tifgreen		5.8	7.4	3.8	3.7	4.4	5.8	7.3
Tifdwarf		7.3	8.2	5	5	5.3	7.2	8.1
Tifway			6					
TifSport			6					
<b>ST-5</b>		<b>7.8</b>	<b>8.3</b>	<b>7</b>	<b>6.5</b>	<b>7.2</b>	<b>7.8</b>	<b>8.3</b>
LSD-5%		0.3	0.3	0.9	0.9	0.4	0.3	0.3

Note: Rating on Tifway and TifSport in the 1997 planted test came from an adjacent test managed identical to the ST-5 test except there was no 1/4 inch mowing height. 1997A data came from AZ collect by Charlie Rodgers.

**Table 4 Continued:**

<u>Cultivar</u>	Mow Ht. →	<u>Color</u>		
		<u>1/2</u> inch	<u>1/4</u> inch	<u>1/2</u> inch
	Year Plant →	2000	2000	2000
	<u>Data Year</u> →	<u>2001</u>	2003	<u>2003</u>
Tifdwarf		6.8	2.8	6
Tifway		7.5	6.4	7
TifSport		7.8	6.2	7
<b>ST-5</b>		7.8	7.9	8.3
LSD- 5%		0.3	0.2	0.2

**Table 5. Ratings for tawny mole cricket damage on ST-5 and standard controls. (9=major damage).**

Cultivar	Mow Ht. →	Mole Crickets					
		<u>1/4</u> inch	<u>1/2</u> inch	<u>1/4</u> inch	<u>1/2</u> inch	<u>1/4</u> inch	<u>1/2</u> inch
	Year Plant →	1997	1997	1997	1997	1997	1997
	<u>Data Year</u> →	<u>1998</u>	<u>1998</u>	<u>1999</u>	<u>1999</u>	<u>2000</u>	<u>2000</u>
Tifgreen		4	4	5.8	5.3	5.9	6.5
Tifdwarf		5	5.5	5.5	5.4	6.8	6.8
Tifway			1.3		2.5		4.8
TifSport			1		2.3		2.9
<b>ST-5</b>		1.3	1.8	1.3	1	1.2	2
LSD-5%		0.9	0.9	1.3	1.3	0.6	0.6

Note: Tifway and TifSport data from the 1997 planting came from an adjacent test managed identical to the ST-5 test except there was no 1/4 inch mowing height.

**Table 5 Continued:**

Cultivar	Mole Crickets							
	Mow Ht.	→	1/2 inch	1/2 inch	1/4 inch	1/2 inch	1/4 inch	1/2 inch
	Year Plant	→	2000	2000	2000	2000	2000	2000
	<u>Data Year</u>	→	<u>2001</u>	2002	2003	2003	2004	2004
Tifdwarf			3.3	5.3	9	8.3	8.2	7.8
Tifway			2	2	6	3	2.2	2.7
TifSport			2.3	2.7	5.3	3	2.7	3.4
<b>ST-5</b>			1.7	2	1	1.7	1.8	2.2
LSD-5%			0.4	0.5	0.2	0.2	0.3	0.8

**Table 6. Rating for turf quality on ST-5 and standard controls in the National Turfgrass Evaluation Trials from 2003-2006 in the Southeastern, Southwestern and Transition zones (9=best quality)**

Cultivar	Number of:	Turf Quality in Three US Regions (Zones):		
		Southeast	Southwest	Transition
		States →	7	4
	Locations →	9	5	9
TifSport		6.7	6.5	6
Tifway		6.6	6.4	5.9
Celebration		6.1	6	5.7
Patriot		6.1	5.9	6.5
Midlawn		6	6.3	6.2
<b>ST-5</b>		<b>6.6</b>	<b>6.2</b>	<b>5.8</b>
LSD-5%		0.3	0.3	0.3

**Table 7A. Response of ST-5 and commercial controls to two-lined spittle bugs and bermudagrass mites in greenhouse studies under no-choice conditions (studies conducted by Kris Braman).**

Cultivar	Two-Lined Spittlebug			Bermudagrass Mite	
	Mean Damage Rating Day 30	Mean Number of Nymphs Surviving to Day 30	% Damage due to Adult Feeding	Rating Expt. A	Rating Exp. B
Tifway	0.7	0.3	31	5.6	4.8
TifSport	0	0.3	52	4.6	4.9
Tifdwarf	0.7	0	64		
ST-5	1.3	0.3	47	3.7	3
LSD-5% ns	ns	ns	ns	0.7	0.6

Notes: Higher ratings for bermudagrass mites mean more resistance.

**Table 7B. Response of ST-5 and commercial cultivars to tawny mole crickets in greenhouse studies under no-choice conditions (studies conducted by Kris Braman).**

Cultivar	Tawny Mole Crickets		
	Root Dry Weight % of Control	No. Eggs After 30 Days	No. Crickets After 30 Days
Tifway	52	5.2	2.8
TifSport	67	0	1.8
Tifdwarf	44	7.9	3
ST-5	35	22	2.8
LSD-5% ns	ns	13	1

**Table 8. Response of ST-5 and commercial controls to Fall Armyworm laboratory studies under no-choice conditions (studies conducted by Kris Braman).**

<b>Entry</b>	<b>10 d Larval Wt. mg</b>	<b>Pupal Wt. mg</b>	<b>Days to Develop</b>	<b>% Survival</b>
Tifdwarf	59	171	23	69
Tifway	48	182	25	45
TifSport	29	174	24	32
St-5	22	169	25	41
LSD-5%	ns	ns	ns	ns