Supplement to Journal of Nematology 24(4S):749–756. 1992.

Host Status of Different Bermudagrasses (*Cynodon* spp.) for the Sting Nematode, *Belonolaimus longicaudatus*[1]

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Abstract: Thirty-seven warm-season bermudagrass (*Cynodon* spp.) accessions, two cool-season grasses (*Lolium perenne* and *Festuca arundinacea*), 'Transvala' digitgrass (*Digitaria decumbens*), and *Sorghum bicolor* were evaluated to determine host suitability and susceptibility to the sting nematode, *B. longicaudatus,* in a 140-day microcell bioassay. All seven of the evaluated commercial cultivars of *Cynodon* were suitable hosts for *B. longicaudatus* but varied in their tolerance to the nematode. 'Midiron,' 'Tifdwarf,' 'Tifgreen,' 'Tifgreen II,' 'Tifway II,' and 'Tufcote' were sensitive, with reductions in root weight of >24%, whereas 'Tifway' appeared to be relatively tolerant with only a 4% reduction in root dry weight. Twenty other *Cynodon* accessions showed decreases ($P \leq 0.05$) in root dry weight relative to uninoculated plants of the same germplasm and (or) >11% root reductions. In addition to 'Tifway,' 10 other *Cynodon* accessions and *L. perenne, F. arundinacea, D. decumbens,* and *S. bicolor* appeared to be relatively more tolerant of *B. longicaudatus* than the other accessions evaluated.
Key words: Belonolaimus longicaudatus, bermudagrass, *Cynodon* spp., digitgrass, grass, host-plant resistance, nematode, perennial ryegrass, sorghum, sting nematode, tall fescue.

Hybrid bermudagrasses (*Cynodon* spp.) are used in the southern United States and California for golf courses and athletic fields and usually involve crosses of *C. dactylon* (L.) Pers. and *C. transvaalensis* J. B. Davy (11). One major limitation for cultivating bermudagrass in the sandy soils of Florida and the southeast is the destruction of roots by phytoparasitic nematodes (13). In fact, bermudagrass is not suitable for most home lawn situations in Florida because of the need for extensive maintenance and restricted use pesticides (11). The most destructive nematode in these turfgrass ecosystems is the ectoparasitic sting nematode, *Belonolaimus longicaudatus* Rau (3,13). This nematode damages or destroys lateral roots of a wide variety of plants as soon as they are formed, which causes root pruning, decreased water and nutrient uptake, and decreased rates of evapotranspiration (2,10,13). During periods of peak nutrient and water demand, parasitized plants perform poorly and can exhibit symptoms such as premature wilting, chlorosis, or death (10).

Currently, research has focused on the use of postplant nematicides (6), cultural methods (7), and potential biological control agents (5,8) for the management of the sting nematode in bermudagrass. However, the most persistent and cost-effective control strategy with the least number of ecological ramifications for nontarget species is the use of nematode-tolerant or resistant plants.

Very few turfgrass species or cultivars have been evaluated for their tolerance or susceptibility to *B. longicaudatus* (2,10). A Georgia population of *B. longicaudatus* readily reproduced on six cultivars of bermudagrass, including the commonly used cultivar 'Tifdwarf' (10). Recent work with an isolate of *B. longicaudatus* from Sanford, Florida, suggests that there is differential host suitability in diploid *Stenotaphrum secundatum* (Walt.) Kuntze (St. Augustinegrass) (2). Several forage grasses, including 'Transvala' digitgrass (*Digitaria decumbens* Stent.), are reportedly resistant to *B. longicaudatus* (3,4). Preliminary field research in Gainesville, Florida, suggests that there is differential host suitability and susceptibility to *B. longicaudatus* in *Digitaria* spp. (digitgrasses), *Paspalum* spp., and *Chloris* introductions, and limited differential susceptibility in *Hemarthria* spp. (3,14).

The objective of this project was to eval-

Received for publication 10 February, 1992.
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We thank John Cangiamila, Barbara Center, Barbara Clement, and Georgia Pagonis for technical assistance and Phil Busey and Tom Weissling for critical review. This project was partially funded by a grant from the Florida Turfgrass Research Foundation, Inc. to R.M.GD. and J.L.C.

uate a collection of newly identified or well-known bermudagrass cultivars and accessions for differences in host suitability and susceptibility to an isolate of *B. longicaudatus*.

Materials and Methods

Commercial cultivars of *Cynodon*, 'Tifdwarf,' 'Tifgreen,' 'Tifgreen II,' 'Tifway,' and 'Tifway II,' and newly selected germplasm available from the National Bermudagrass Test (1986), the National Turfgrass Evaluation Program, or from other sources were evaluated in this study (Table 1). Pure cultures of each vegetatively propagated bermudagrass accession and 'Transvala' digitgrass were established from aerial sprigs into autoclaved sand and maintained on screen benches 70 cm above ground. These were sequentially subcultured at least twice before being used as stock cultures for aerial sprig production for the experiment. Perennial ryegrass, *Lolium perenne* L. ('Pebble Beach'), tall fescue, *Festuca arundinacea* Schreb. ('DBC/Tradition'), and *Sorghum bicolor* (L.) Moench also were included in the study and propagated directly from seed (Table 1).

Tapered (1 degree) C-4 pine cells (height = 16.1 cm; 2.5 cm d.; volume = 65.6 cm^3; Stuewe and Sons, Corvallis, OR) were filled with 80 g of autoclaved 60-mesh silica sand and used as experimental units. Each cell was plugged with nonabsorbent cotton to prevent loss of sand from the drainage holes. Twenty cells were established from single nematode-free aerial sprigs of equal wet weight for each grass species or accession (<10% CV within genotype; see Table 1) and were inserted into #7 styrofoam blocks (Stuewe and Sons) to moderate temperature fluctuations. Groups of two to four different grasses were established daily, except weekends, starting 30 January 1991 through 27 February 1991. Sprigged or seeded cells were placed on a bench in a mist house for root establishment or germination for 21 days.

TABLE 1. *Cynodon* spp. and other grasses evaluated for host suitability and susceptibility to *Belonolaimus longicaudatus*.

Species	Cultivar or designation	Mean sprig wet weight at start (mg)
Cynodon spp.	A 22†	127
Cynodon spp.	A 29	199
Cynodon spp.	Arizona Common	151
Cynodon spp.	CT 23	92
Cynodon spp.	E 29	180
Cynodon spp.	FB 119	187
Cynodon spp.	Hawaii 103	57
Cynodon spp.	Hawaii 104	72
Cynodon spp.	Hawaii 111	178
Cynodon spp.	Hawaii 213	73
Cynodon spp.	Hawaii 315	56
Cynodon spp.	Hawaii 403	115
Cynodon spp.	Hawaii 605	140
Cynodon spp.	Hawaii 1001	170
Cynodon spp.	Hawaii 1011	55
Cynodon spp.	Hawaii 1111	44
Cynodon spp.	Hawaii 1210	61
Cynodon spp.	'Midiron'	154
Cynodon spp.	MSB 10	139
Cynodon spp.	MSB 20	61
Cynodon spp.	MSB 30	153
Cynodon spp.	NM 72	139
Cynodon spp.	NM 375	142
Cynodon spp.	NM 471	122
Cynodon spp.	NM 507	126
Cynodon spp.	NMS 1	145
Cynodon spp.	NMS 3	129
Cynodon spp.	NMS 4	104
Cynodon spp.	PF 11	58
Cynodon spp.	PF 84	64
Cynodon spp.	RS 1	151
Cynodon spp.	'Tifdwarf'	66
Cynodon spp.	'Tifgreen'	68
Cynodon spp.	'Tifgreen II'	94
Cynodon spp.	'Tifway'	114
Cynodon spp.	'Tifway II'	84
Cynodon spp.	'Tufcote'	88
Digitaria decumbens	'Transvala'‡	173
Festuca arundinacea	'DBC/Tradition'§	S‖
Lolium perenne	'Pebble Beach'§	S
Sorghum bicolor¶		S

† All *Cynodon* designations except 'Tifdwarf' and those with the prefix Hawaii or PF were obtained from Dr. A. E. Dudeck, University of Florida, from his National Turfgrass Evaluation Program. Descriptions of the origins and texture of these grasses are available in the National Bermudagrass Test, 1986; Progress Report 1990 (NTEP No. 91–11) from Kevin Morris, NTEP, BeltsvilleARC West, Bldg. 001, Rm. 333, Beltsville, MD 20705. Hawaii = *Cynodon* accessions collected by Dr. A. E. Dudeck, University of Florida, from the Hawaiian Islands. PF = *Cynodon* accessions from Mr. Paul Frank, Wilderness Country Club, Naples, FL.

‡ Obtained from Dr. F. T. Boyd, University of Florida.

§ Obtained from Mr. Sean Currans, Pennington Seed Inc., Lebanon, OR.

‖ S = seeded grass.

¶ Obtained from Dr. Harlan Rhoades, University of Florida, Sanford, FL.

Inoculations with *B. longicaudatus* were done 21 days after sprigging or seeding for all grasses, except *F. arundinacea* and *L. perenne*. These grasses were grown for 21 days in the mist house and then for 5 weeks outside on a raised bench. At 8 weeks, the oldest and next oldest leaf sheaths of these grasses were removed and stained with 0.1% aniline blue in lactophenol overnight and examined for the characteristic hyphae of the endophytic fungi, *Acremonium coenophilum* Morgan-Jones & Gams (associated with *F. arundinacea*) or *A. lolii* Latch, Christensen & Samuels (associated with *L. perenne*) (17). Only confirmed endophyte-free *F. arundinacea* and *L. perenne* were used in this study.

All grasses were grown under partial shade outdoors on screened benches and were harvested 140 days after inoculation in the same sequence as they were established and inoculated. Temperature was monitored daily, except weekends, at a 2.5-cm depth at 1400–1500 hours with an Omega HH 82 digital thermometer (Omega Engineering, Stamford, CT) and ranged between 27–34 C during the experiment. Municipal water was applied daily just before sunrise for 30 minutes and again for 20 minutes just after noon. Once or twice weekly, each cell received two ml of fertilizer solution (224 mg N, 235 mg K, 160 mg Ca, 62 mg P, 32 mg S, 24 mg Mg, 50 mg Cl, 25mg B, 2 mg Mn, 2 mg Zn, 0.5 mg Cu, 0.5 mg Mo, and 20 mg Fe per liter, adjusted to pH 6.5 with 1 N KOH) per application (total of 33 applications for the experiment; total N for the experiment = 132 mg/cell).

Belonolaimus longicaudatus cultures were established from inoculum obtained from Dr. Harlan Rhoades from Sanford, Florida. They were cultured and maintained on Tifgreen II bermudagrass grown on autoclaved Margate fine sand in pots for several months in a temperature-controlled water bath at 27 C before being harvested by the sugar-flotation method (9) for quantification and inoculation. Eight cells of each grass species or accession were inoculated with 46 ± 7 (SD) *B. longicaudatus* in ca. 1 ml of water, and an additional eight cells were used as uninoculated controls. The nematodes were pipetted into a single depression near the base of the plant.

The grasses were maintained at ca. 2.5 cm mowing height, and all grass clippings were recovered, dried at 60 C for at least 48 hours, and weighed. At 140 days after inoculation, the plant in each cell was clipped off at the soil line, and the crown, stolon, and rhizomes were dried, weighed, and added to the clippings for a cumulative top growth dry weight. The sand was gently rinsed off the roots and container into a bowl. Rinsates were passed through a sieve (38 µm openings) to catch any *B. longicaudatus* present. The sieve was backwashed into a calibrated Nalgene centrifuge tube and the volume brought to a total of 20 ml. Nematode counts were made from a 2.5-ml subsample on a gridded counting dish on an inverted microscope. Counts of 0 nematodes were relatively rare and considered inoculation failures and were not included in any computations for nematode density or plant performance. Roots were dried at 60 C for at least 48 hours, hand sorted from excess clinging debris, and weighed.

Cumulative top growth and root dry weights for control (uninoculated) and *B. longicaudatus*-inoculated cells from the same cultivar were compared statistically with a nonparametric Kruskal-Wallis *t*-test (χ^2 approximation) (15). The equation [100 × (*mean* of the uninoculated − *mean* of the inoculated) ÷ *mean* of the uninoculated] (16) was used to calculate the mean percentage reduction in root dry weight or top growth (cumulative) for general comparisons and to aid in the categorization of the host status of different germplasm to *B. longicaudatus*. Arbitrarily, a >11% reduction in root dry weight was chosen as a coindicator of host sensitivity, whereas a ≤11% reduction was used to help categorize plants with relatively low host sensitivity.

TABLE 2. Population densities of *Belonolaimus longicaudatus* and dry weights of shoots and roots per cell of *Cynodon* spp. and other grasses 140 days after inoculation.

Cultivar	*N*†		Nematodes/cell	Nematodes/g root dry weight	Cumulative top dry weight (mg)	Mean % top dry weight reduction‡	Root dry weight (mg)	Mean % root dry weight reduction§
NMS 1	I	8	234 ± 141	1438 ± 1092	1015 ± 152	1	208 ± 100**	66
	U	8			1023 ± 85		603 ± 258	
Hawaii 213	I	8	350 ± 229	3349 ± 2113	1003 ± 133	−10	114 ± 53**	59
	U	8			911 ± 82		280 ± 108	
NMS 3	I	8	229 ± 105	2234 ± 889	1193 ± 140*	−30	104 ± 21***	55
	U	8			916 ± 171		233 ± 43	
NM 507	I	8	297 ± 131	630 ± 367	877 ± 97	−5	513 ± 99**	50
	U	8			836 ± 76		1024 ± 512	
'Tifgreen'	I	8	291 ± 243	1739 ± 1258	556 ± 96	−4	173 ± 65**	49
	U	8			537 ± 65		338 ± 30	
'Midiron'	I	8	210 ± 57	929 ± 466	904 ± 83**	16	257 ± 76**	46
	U	8			1079 ± 61		473 ± 161	
NM 471	I	8	312 ± 169	1140 ± 673	1019 ± 136	−10	289 ± 37*	45
	U	8			925 ± 138		523 ± 137	
MSB 10	I	8	232 ± 210	2079 ± 2676	766 ± 109	5	149 ± 42***	43
	U	8			810 ± 105		261 ± 62	
Hawaii 1001	I	7	146 ± 40	965 ± 394	819 ± 154	2	159 ± 27**	43
	U	7			834 ± 87		280 ± 92	
E 29	I	8	197 ± 94	950 ± 94	996 ± 70	3	213 ± 36**	41
	U	8			1027 ± 84		360 ± 58	
A 22	I	8	365 ± 163	2458 ± 1271	885 ± 77	−7	158 ± 45**	40
	U	8			830 ± 55		263 ± 60	
'Tifway II'	I	8	266 ± 192	1530 ± 1080	820 ± 101	−4	182 ± 38*	40
	U	8			786 ± 121		305 ± 186	
'Tufcote'	I	8	221 ± 118	391 ± 376	915 ± 81	2	706 ± 253	39
	U	8			929 ± 66		1151 ± 606	
Hawaii 1111	I	7	289 ± 94	1728 ± 805	713 ± 62	−7	184 ± 51	37
	U	8			668 ± 133		291 ± 154	
'Tifdwarf'	I	8	431 ± 233	2679 ± 1539	875 ± 63*	−10	165 ± 24**	36
	U	8			793 ± 69		256 ± 54	
Arizona	I	7	166 ± 133	1297 ± 1203	850 ± 172	6	126 ± 43*	36
Common	U	8			900 ± 104		198 ± 75	
Hawaii 403	I	7	241 ± 79	1166 ± 586	1121 ± 213	−10	244 ± 100**	35
	U	8			1018 ± 79		374 ± 54	
Hawaii 605	I	8	217 ± 96	938 ± 342	959 ± 238*	−15	236 ± 93	30
	U	8			833 ± 112		334 ± 175	
Hawaii 111	I	8	73 ± 70	240 ± 251	960 ± 111	−1	310 ± 32*	28
	U	8			951 ± 141		428 ± 115	
'Tifgreen II'	I	8	225 ± 120	712 ± 618	1031 ± 172	8	413 ± 173	25
	U	8			1114 ± 100		550 ± 124	
NM 72	I	8	130 ± 80	239 ± 130	670 ± 129*	17	609 ± 387	25
	U	8			806 ± 100		814 ± 234	
RS 1	I	8	89 ± 55	529 ± 391	906 ± 85*	9	189 ± 47*	25
	U	8			994 ± 68		253 ± 55	
NM 375	I	8	33 ± 22	102 ± 74	1010 ± 98	−5	334 ± 32*	25
	U	8			958 ± 55		448 ± 120	
A 29	I	8	332 ± 175	1195 ± 1047	823 ± 267	−6	400 ± 198	23
	U	8			775 ± 141		522 ± 261	
FB 119	I	7	175 ± 119	445 ± 273	989 ± 252	−19	438 ± 194	17
	U	7			829 ± 97		527 ± 268	
MSB 30	I	7	153 ± 118	507 ± 502	1024 ± 134	−12	403 ± 145	15
	U	8			915 ± 108		473 ± 159	
'Transvala'	I	8	22 ± 16	100 ± 75	1213 ± 114*	11	235 ± 47	11
Digitaria	U	8			1356 ± 113		264 ± 39	
NMS 4	I	7	165 ± 80	523 ± 303	1112 ± 92**	−22	333 ± 71	10
	U	8			909 ± 104		369 ± 91	

TABLE 2. *Continued*

Cultivar	N†		Nematodes/cell	Nematodes/g root dry weight	Cumulative top dry weight (mg)	Mean % top dry weight reduction‡	Root dry weight (mg)	Mean % root dry weight reduction§
Hawaii 103	I	5	30 ± 24	63 ± 43	806 ± 62	5	474 ± 123	10
	U	8			851 ± 72		528 ± 167	
'Pebble Beach'	I	9	49 ± 41	98 ± 78	608 ± 153*	−36	527 ± 193	9
Lolium	U	9			448 ± 149		581 ± 147	
Sanford	I	8	548 ± 235	537 ± 245	2181 ± 303	3	1023 ± 148	8
Sorghum	U	8			2236 ± 151		1116 ± 135	
PF 84	I	8	353 ± 131	1376 ± 833	727 ± 56	−6	333 ± 167	8
	U	8			689 ± 169		360 ± 107	
PF 11	I	8	349 ± 189	830 ± 765	784 ± 153	−4	548 ± 249	7
	U	8			754 ± 63		589 ± 142	
CT 23	I	7	176 ± 90	506 ± 331	784 ± 84	8	368 ± 120	6
	U	8			852 ± 59		391 ± 51	
Hawaii 104	I	6	75 ± 38	110 ± 60	852 ± 79	−10	717 ± 324	5
	U	8			776 ± 87		751 ± 207	
'Tifway'	I	8	287 ± 171	1094 ± 609	863 ± 74	−5	286 ± 123	4
	U	7			826 ± 92		299 ± 95	
Hawaii 315	I	6	80 ± 49	323 ± 275	686 ± 50	14	283 ± 106	4
	U	8			797 ± 118		296 ± 56	
'DBC'	I	9	105 ± 145	87 ± 110	1497 ± 297	−22	1133 ± 196	2
Festuca	U	9			1228 ± 522		1156 ± 345	
Hawaii 1011	I	7	59 ± 31	269 ± 161	710 ± 121	0	251 ± 83	−12
	U	8			708 ± 57		224 ± 80	
MSB 20	I	8	415 ± 167	673 ± 440	1029 ± 141	−6	734 ± 295	−39
	U	8			974 ± 97		531 ± 237	
Hawaii 1210	I	4	88 ± 57	220 ± 98	713 ± 97	15	395 ± 127	−43
	U	8			838 ± 138		277 ± 71	

Data are means ± standard deviations.

† *N* = number of cells (replicates); I = inoculated with 46 ± 7 *B. longicaudatus;* U = uninoculated.

‡ 100 × [(mean cumulative top weight of the uninoculated − mean cumulative top weight of the inoculated) ÷ mean cumulative top weight of the uninoculated].

§ 100 × [(mean root weight of the inoculated − mean root weight of the unionculated)/mean root weight of the uninoculated].

*, **, *** indicate differences from uninoculated significant at $P \leq 0.05$, $P \leq 0.01$, and $P \leq 0.001$, respectively, according to the Kruskal-Wallis test (χ^2 approximation).

RESULTS AND DISCUSSION

Nematode-inoculated plants of 26 *Cynodon* accessions exhibited a decline in root dry weights ($P \leq 0.05$) relative to the uninoculated controls and (or) a reduction in mean root dry weight of >11% (Table 2), and therefore these accessions were considered sensitive to damage by *B. longicaudatus.* All of these 26 susceptible bermudagrasses (except NM 375) were suitable hosts for *B. longicaudatus* reproduction, with >73 nematodes per cell and >239 nematodes per g root dry weight. Relatively low numbers of sting nematodes were recovered from the bermudagrasses RS 1, Hawaii 111, or NM 375, each with less than 100 nematodes per cell after 140 days. This data may indicate a hypersensitive host or a low density due to a reduction in root quantity and (or) quality.

At present, the cultivars Tifdwarf and Tifgreen (T-328) are the standard turfgrasses used in golf course greens, and Tifway (T-419) is the standard used for fairway construction. Tifdwarf and Tifgreen were very suitable hosts and had significant root reductions when inoculated with nematodes (Table 2). Interestingly, four bermudagrasses (Hawaii 605, NMS 3, NMS 4, and Tifdwarf) had significant increases in cumulative top growth. Johnson (10) reported similar trends for clipping weights for Tifdwarf and four other cultivars. These observations may be a result of negative feedback, which leads to increased photosynthetic area in nematode-parasitized grass for production of carbohydrates to compensate the damaged root system. In this experiment, mowing frequency and height (2.5 cm) did not provide intensive leaf defoliation pressure. However, under typical golf course conditions such as fairways (cut at 1.3 cm) or greens (cut at 0.5–0.7 cm), above-ground defoliation is intensive enough that this strategy could quickly exacerbate root problems.

Seven *Cynodon* accessions (MSB 30, FB 119, A 29, NM 72, NM 375, RS 1, and Tifgreen II) were intermediate in sensitivity to challenge by *B. longicaudatus* (Table 2). Root reduction percentages of these accessions ranged between 15% and 25%, and there were no significant differences between uninoculated and inoculated root dry weights (Table 2). Tifgreen II is not commonly used in southern Florida because of excessive seed head production, thin stand at low mowing height, and its apple-green coloration (11). However, in low-maintenance (mowing height = 1.3 cm), high-nematode-density experimental areas at the Ft. Lauderdale Research and Education Center, Tifgreen II appeared to persist better than Tifgreen or Tifdwarf (1, unpubl. obs.).

Twelve grasses, eight of which were *Cynodon* spp., had a 2–11% reduction in root dry weight and showed no significant differences in root weight between inoculated and control cells (Table 2). All of these grasses except *F. arundinacea* ('DBC/Tradition') without *A. coenophialum*, *L. perenne* ('Pebble Beach') without *A. lolii*, Hawaii 103, and *D. decumbens* ('Transvala') were potentially suitable hosts for *B. longicaudatus* using an arbitrary standard for host suitability of >100 nematodes per g of root dry weight. This suggests that under the conditions of this experiment, *S. bicolor*, PF 84, PF 11, Tifway, CT 23, NMS 4, Hawaii 315, and Hawaii 104 were relatively tolerant of *B. longicaudatus;* whereas *F. arundinacea* cv DBC/Tradition, *L. perenne* cv Pebble Beach, Hawaii 103, and *D. decumbens* cv Transvala were relatively resistant. Cool-season grasses such as perennial ryegrass, *L. perenne,* are often used for winter overseeding of *Cynodon* when it goes semidormant in Florida. The relatively low host suitability observed in this study may help explain the lack of *B. longicaudatus* response to the increased root biomass of *L. perenne* produced by this practice (7).

Tifway and Tifway II each supported similar numbers of *B. longicaudatus* per cell (Table 2). However, Tifway appeared to be more tolerant of the sting nematode than Tifway II in terms of root response. In fact, Tifway II was very similar to the highly susceptible Tifgreen in terms of plant performance (Table 2). This is contrary to the idea that Tifway II has improved nematode tolerance over Tifway and Tifgreen (11). Interestingly, Tifway is by far the most popular of the two cultivars for golf course fairways and sports fields in Florida. The two *Cynodon* accessions from southern Florida (PF 11 and PF 84) appeared to be similar to Tifway in relative tolerance to *B. longicaudatus.* However, this needs to be confirmed under fairway and (or) greens conditions.

MSB 20, Hawaii 1210, and Hawaii 1011 showed >12% increases ($P > 0.05$) in root dry weight when inoculated with *B. longicaudatus* (Table 2). Of these three grasses, MSB 20, a fairway-textured bermudagrass, was an excellent host for the sting nematode, suggesting that it may be highly tolerant. The two Hawaiian accessions were apparently not very good hosts for *B. longicaudatus* and appeared resistant under the conditions of this study.

Our results suggest that there are differences in host suitability and susceptibility in different bermudagrass accessions to *B. longicaudatus.* Unfortunately, all of the commercial standards except Tifway were both sensitive and susceptible hosts for *B. longicaudatus.* Johnson (10) reported that 'Common' *C. dactylon* supported a 42-fold increase in a Georgia isolate of *B. longicaudatus* vs. 6- to 17-fold increases in three cultivars of *C. dactylon* ('Tufcote,' 'U-3,' and 'Continental') and two cultivars from crosses of *C. dactylon* × *C. transvaalensis* (Tifdwarf and 'Tiffine'). However, all six cultivars responded similarly to sting nematode pressure in terms of top growth and root weights. In a 5-month study of bermudagrass accessions inoculated with a mixed sample of phytoparasitic nematodes (including *B. longicaudatus*), Tifdwarf and Tifgreen showed 36–39% root dry weight reductions, which appeared to correlate with increases in the lance nematode, *Hoplolaimus galeatus* (Cobb); whereas FB 119 and Tifway had only 1–3% reductions and relatively low *H. galeatus* numbers (16). Densities of *B. longicaudatus* were not different ($P \geq 0.05$) at the conclusion of the experiment for the eight different accessions. In our study, Tifdwarf, Tifgreen, and Tifway had similar percentage root reductions, but FB 119 had a much higher percentage root reduction than reported by Tarjan and Busey (16), and all four grasses were suitable hosts for *B. longicaudatus*.

One potential problem with focusing on a single nematode species in germplasm screening is the risk of inadvertantly creating or exacerbating other pest problems. Murray et al. (12) reported that Tifdwarf, Tufcote, A 29, and E 29 were susceptible hosts for *Meloidogyne graminis* (Sledge & Golden) Whitehead but that 'Midiron' was moderately resistant. Unfortunately, all of these bermudagrasses were susceptible to *B. longicaudatus* in our study (Table 2).

The results of our study are preliminary and can only be used as a means of tentatively identifying germplasm with some promise for future expanded studies. However, these data suggest that more tolerance or resistance to *B. longicaudatus* exists in previously unscreened *Cynodon* germplasm than in most of the currently available cultivars. Future screening research should use germplasm from the center of diversity of the host genus *Cynodon* (southern Africa) and involve more geographical and host isolates of *B. longicaudatus*.

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