UF IFAS Extension UNIVERSITY of FLORIDA

HS1239

New Sources of Southern Chinch Bug Resistance in St. Augustinegrass[1]

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Introduction

St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kuntze, is widely used for lawns throughout the southern United States and is the predominant turfgrass for lawns in Florida. The southern chinch bug, *Blissus insularis* Barber (Figure 1), is the plant's most damaging insect pest. Figure 2 shows damage of St. Augutinegrass caused by southern chinch bugs. Prior to the release of resistant Floratam St. Augustinegrass in 1973 (Horn et al 1973), control of southern chinch bug was primarily through insecticidal applications. Host plant resistance in Floratam lasted until 1985, when southern chinch bug damage on Floratam was reported in Florida (Busey and Center 1987) and later confirmed by Cherry and Nagata (1997).

Figure 1. Southern chinch bug, *Blissus insularis* Barber. From left to right: nymph, short-wing, and long-wing adults
Credits: Ronald Cherry

Figure 2. Southern chinch bug damage to St. Augustinegrass
Credits: Ronald Cherry

Busey (1990) identified several new resistant lines of St. Augustinegrass, which led to development of the variety FX-10 St. Augustinegrass (Busey 1993). However, FX-10 was never extensively grown due to several negative characteristics, including a very coarse appearance and tough texture (Busey 1993). More recently, Nagata and Cherry (2003) reported on the resistance of NUF-76 St. Augustinegrass to southern chinch bug. NUF-76 is the first diploid line identified as resistant to southern chinch bug, unlike polyploids such as Floratam and FX-10. Although

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NUF-76 has been shown to be widely resistant to southern chinch bug populations in Florida (Nagata and Cherry 2003), Reinert (2008) and Reinert et al. (2011) reported that it is not resistant to some Texas populations. NUF-76 has been named "Captiva" for marketing purposes and is currently being sold to the general public in Florida.

Currently, Captiva is the only chinch bug-resistant variety of St. Augustinegrass grown on sod farms in Florida. However, based on past experience with Floratam, it is highly probable that the chinch bugs will also overcome resistance in Captiva in the future. Moreover, it is desirable to have other chinch bug resistant varieties available with different agronomic qualities such as shade tolerance, drought tolerance, etc.

Identification of New Resistant Lines

A preliminary screening to detect resistance to chinch bugs was conducted at the UF/IFAS Everglades research station on 36 untested St. Augustinegrass lines. These tests were conducted by collecting chinch bugs from different locations and then mixing the insects into one population to obtain a better average response of the insects to the lines. Twelve lines and Floratam were evaluated in each of three tests. Floratam was used as control, since it is the most widely used variety in Florida and is known to be susceptible to southern chinch bugs. Ten adults and ten large nymphs (3-5 instar) were put into a 0.95 liter wide-mouth glass jar. The mouth of the jar was covered with a fine mesh cloth secured by the screw-on jar ring. Each jar contained one three-node stolon of a variety in a water-filled glass vial sealed with parafilm to provide water for the stolon. A fresh stolon and vial were added after one week. Jars were stored at 28°C and 14L/10D. Jars were opened after 14 days and chinch bug survival noted. Floratam had an average of 16 surviving chinch bugs/jar. Survival in the 36 lines ranged from 0 to 19/jar. Ten lines had survival ranging from 0 to 4 bugs/jar, and these were selected for further testing.

The ten lines from the previous test with lowest chinch bug survival were then tested against Floratam in more extensive tests. Chinch bugs were collected from seven different locations in Palm Beach County, Florida, with each location used for one replication. Each replication was tested as previously described. Data from the seven replicates were pooled and analyzed as previously described. The results are shown in Table 1.

In the test with those ten lines, five lines had significantly lower survival of chinch bugs than Floratam (Table 1).

Table 1. Survival of chinch bugs held two weeks on eleven St. Augustinegrass lines

Variety/line	Mean*	Range
Floratam	13.7a	4–18
1223	14.7a	10–19
1433	10.6ab	1–17
4382	10.4ab	5–18
1262	10.1ab	2–19
4822	9.4abc	2–17
4872	7.0bcd	1–13
1441	6.4bcd	3–13
3241	5.9bcd	0–15
3231	4.1cd	0–11
5441	2.9d	1–9

*Means followed by the same letter are not significantly different (P > 0.05) using a LSD test (SAS 2011).

Hence, these five lines were selected for additional resistance screening using a different method (Cherry et al. 2011). In this test, chinch bugs were tested against potted plants with stolons still attached. Each replicate consisted of testing chinch bugs against one plant of each line. One runner/plant was inserted into a 15 cm long, 4 cm diameter clear plastic tube. A sponge was cut to size so that it wrapped around the runner and was wedged into the tube, thus preventing chinch bug escapes at that end. As in previous tests, 10 adults and 10 large nymphs were placed in each tube. The other end was closed with a fine mesh cloth held in place with rubber bands to prevent chinch bug escape. Plants with tubes were held at ambient conditions as previously described. Plants were watered every 3–4 days. Water was lightly sprayed into tubes every 3–4 days to provide moisture for the chinch bugs. After 14 days, the tubes were opened and chinch bug survival determined. Five replicates were conducted over a six-month period, and data was pooled for analysis. Survival of chinch bugs on live stolons in tubes is shown in Table 2. Line 1441 was not significantly different from Floratam in this test. It is unknown why this line showed different resistance in the

Table 2. Survival of chinch bugs held two weeks on six St. Augustinegrass lines

Variety/line	Mean*	Range
Floratam	13.4a	7–18
1441	11.4a	4–18
3231	5.4b	2–16
4872	3.8b	0–9
3241	3.6b	0–7
5441	3.0b	2–17

*Means followed by the same letter are not significantly different (P > 0.05) using a LSD test (SAS 2011).

jar test using cut stolons (Table 1) versus the tube test using intact stolons (Table 2). However, 4 of the 5 lines showed consistent resistance in both tests (Tables 1 and 2) using the two different methods.

Morphological Traits and Grass Qualities of the Resistant Lines

Morphological measurements were made on those four lines that showed resistance to southern chinch bugs in both jar tests and tube tests. After the chinch bug tests, stolons from each of the four lines and Floratam were removed. Plants were then moved to an outside bench receiving direct sunlight and 6 g fertilizer containing nitrogen, phosphorus, and potassium (Scotts 14-14-14) was applied to each pot. The plants were kept under a mist irrigation system that automatically turned on for five minutes per day. Data on morphological traits were collected from each plant one month post fertilizer application. The morphological traits measured included leaf blade length, width, sheath length, and internode length of the first fully-expanded node from the tip of the longest stolon. In addition, leaf color of each line was recorded as dark green, green, and light green, and leaf texture as coarse, medium, and fine. The results (Table 3) showed that all the lines had significantly shorter leaf blades and sheathes than Floratam. Floratam, a coarse-textured variety (Trenholm et al. 2011), also had significantly greater leaf width than line 3231. Line 5441 was similar to Floratam in internode length, but all other lines had shorter internodes. The leaf colors of all lines are green, except for line 3231, which produces dark green leaves. All lines possess the characteristics of short, narrow leaves with green or dark green color and fine texture desirable for a high quality grass.

The four lines were then transplanted into a field at EREC for field trials to evaluate the suitability for release as cultivars for Florida homeowners and landscaping managements to use on lawns. Three lines (3231, 3241, and 4872) survived. Among the three lines, 3231 (Figure 3) and 4872 (Figure 4) appear to have a turf quality (leaf color and turf quality) similar to or better than Floratam (Figure 5) during the period of September 2013 and March 2014 (Table 4). Although further field variety trials need to be conducted at multiple locations for multiple years to evaluate their adaptation to different environmental conditions, these two lines have the potential to be released as new resistant cultivars in the future.

Figure 3. Line 3231 St. Augustinegrass
Credits: Huangjun Lu

Table 3. Morphological characteristics of Floratam and four southern chinch bug resistant lines of St. Augustinegrass

Variety/line	Leaf blade length (mm)	Leaf width (mm)	Sheath length (mm)	Internode length (mm)	Leaf color	Leaf color
Floratam	32.2a*	7.2a	23.4a	53.0ab	Green	Coarse
3231	17.0d	5.6b	15.8c	44.0cd	Dark green	Fine
3241	19.4cd	7.0a	16.2c	48.0bc	Green	Fine
4872	22.0bc	6.4ab	20.2b	45.0bcd	Green	Fine
5441	24.4b	6.6ab	20.6b	58.0a	Green	Fine

*Means followed by the same letter in a column are not significantly different (P > 0.05) using a LSD test (SAS 2011).

Table 4. Performance of two southern chinch bug resistant lines of St. Augustinegreass in the field trials

Variety/line	September 2013		January 2014		March 2014	
	Color*	Turf quality	Color	Turf quality	Color	Turf quality
3231	8	7	6	5	8	6
4872	8	8	7	6	7	7
Floratam	6	7	6	5	7	6

*Color ratings were based on the scales 1–9 with 9 = dark green color and 1 = no green and turf quality ratings were based on the scales 1–9 with 9 = ideal density and 1 = no live turf as described in Carrow (1996).

Figure 4. Line 4872 St. Augustinegrass
Credits: Huangjun Lu

Figure 5. Floratam St. Augustinegrass, the primary turfgrass cultivar for lawns in Florida
Credits: Huangjun Lu

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