road sides, large acreage or "back lots" that do not receive the scrutiny of a lawn-type installation.

*Considerations.* While the Association is providing this instrument to establish some control of the industry, it is not a regulatory agency. The Standards of Sod Quality give the sod user a tool to provide their own enforcement. Product labeling forces the seller to specify, in writing, what he claims the product to represent. The Quality Grades could be argued as arbitrary, but in fact they provide a consistent definition from one end of the State to the other. Consistency has been the missing ingredient in most experiences with sod.

Even though the Standards were developed by the Turfgrass Producers Association of Florida, the application should not be limited to TPAF members. Anytime sod is sold, the invoice should reflect the type of sod and the quality. If the sod is not purchased directly from a farm, it still had to come from one and it should be accompanied by that sales slip or a copy.

The key to a "profitable" sod purchase is dealing with a reputable grower/suppler. As with anything, the product is only as good as the one that stands behind it. The Standards of Sod Quality provide buyer and seller with common language to communicate what each one expects to receive in a transaction.

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# VULNERABILITY OF ST. AUGUSTINEGRASS TO THE SOUTHERN CHINCH BUG

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*Additional index words.* breeding, cultivars, Hemiptera, monoculture, pest, resistance, turfgrass.

*Abstract.* **The southern chinch bug, *Blissus insularis* Barber, is a serious pest of St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kuntze. Both pesticidal and genetic resistance strategies have been overcome by this resilient pest. In 1973, 'Floratam' St. Augustinegrass was released because of its resistance to the southern chinch bug. In 1985 Floratam was killed in some places by a population of the southern chinch bug adapted to feed on this host. The objective of this study was to assess the status of the southern chinch bug as a pest of St. Augustinegrass in Florida. A survey was conducted involving 23 sod producers and the 67 county extension offices in Florida. County extension agents indicated that the chinch bug was the most serious insect pest of St. Augustinegrass turf, followed by mole crickets, caterpillars, and white grubs. Sod producers indicated that the chinch bug was slightly less serious than caterpillars. Most (37 out of 67) county agents and most (14 out of 23) sod producers indicated that they knew of chinch bug damage to Floratam.**

Chinch bugs (*Blissus* spp.) have periodically exerted sudden and widespread damage to grass crops. In 1785 *Blissus leucopterus* (Say) threatened to destroy the entire North Carolina grain crop (7). In 1864, the same species also destroyed 75% of the wheat and 50% of the maize in much of the Mississippi Valley, "with an estimated loss of more than one hundred million of dollars in the currency that then prevailed" (11). This spawned some of the earliest attempts at biological control. In 1888, the Kansas state legislature established an experiment station to produce large quantities of the chinch-bug pathogenic fungus, *Beauveria* sp. (3). To control the chinch bug, 50,000 packages of fungus were distributed to farmers. Following seasonally variable results, the project was abandoned.

In Florida, the southern chinch bug, *Blissus insularis* Barber, has long been recognized as a serious pest and the "chief weakness" of St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kuntze turf (4). The annual cost of chinch bug control and losses in Florida has been estimated at $5 million (5). Despite the importance of the southern chinch bug and the extensive applied research done on it, relatively little is known of its biology (7).

Chemical control strategies for the southern chinch bug have included numerous products, from Snuff No. 2, i.e., nicotine (14), to synthetic pesticides. Chinch bugs have progressively developed resistance to synthetic pesticides developed for their control, including DDT, parathion, diazinon, and chlorpyrifos (10). Considerable amounts of bahiagrass (*Paspalum notatum* Fluegge) were planted in the 1960's because it is not a host for chinch bugs (15).

St. Augustinegrass resistance to chinch bugs has been documented (9) and was the basis for releasing a chinch bug-resistant cultivar, 'Floratam' (6). This resistant, polyploid grass was an environmentally safe alternative to pesticides which had so often failed. In 1985, turfgrass producers reported chinch bugs killing large patches of Floratam. Laboratory studies implicated a new kind of southern chinch bug which was adapted to Floratam (2). Because of the past association of host resistance and polyploidy in St. Augustinegrass germplasm (8) and the ability of the new population to overcome polyploids, it was dubbed PDP (Polyploid Damaging Population). The PDP chinch bug was an ominous sign, because of commercial reliance on Floratam as the only resistant cultivar. For example, in a 1980-81 survey, Floratam represented 77% of commercial sod sampled in southern Florida (1).

The geographic range and damage potential of the PDP southern chinch bug are unknown, but should be monitored. Other aspects of chinch bug distribution and

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host relationships need to be studied. In 1988, we conducted a survey to assess the status of the southern chinch bug as a pest of St. Augustinegrass turf in Florida.

### Materials and Methods

Comparable survey questionnaires were mailed to extension agents in all 67 Florida counties and 50 sod producers, which was the complete population of all known St. Augustinegrass producers. Responses were obtained from all county agents and 23 of the St. Augustinegrass sod producers. County extension agents were asked to consider all turfgrass *except* for sod. Both strata, county agents and sod producers, were asked to report: (A) presence of chinch bug damage (if any) in Floratam and size of damaged areas; (B) the need for pesticidal treatment (if any) against chinch bugs in Floratam; (C) the main chemical used or recommended; (D) the main problem (if any) with chinch bugs in St. Augustinegrass; (E) the relative seriousness of four groups of insects as pests of St. Augustinegrass; and (F) comments. Comments were solicited in two chinch-bug related subjects: best recommendations for dealing with chinch bugs and experience with chinch bugs on grasses other than St. Augustinegrass. County agents were also asked to report the presence of chinch bug damage to any, hence various, St. Augustinegrass(es), and the size of areas affected. Three classes were provided for respondents to describe the size of damaged areas: small, < 1 ft diam; medium, < 10 ft diam; and large, ≥ 10 ft diam. The intention in asking for this information in this way was to obtain an index of insect damage severity, based on the fact that chinch bugs damage turf in distinctive, enlarging patches, which are initially circular. A highly susceptible cultivar, e.g., 'Florida Common', would frequently display killed patches > 10 ft diam, which would be unacceptable. Smaller diameter damaged patches would indicate partial susceptibility and, in some cases, acceptable damage levels.

County extension agents were also asked to estimate the percent of turf areas in their counties which consisted of St. Augustinegrass. To develop a meaningful statewide estimate, county St. Augustinegrass percentages were weight-averaged. The weighting factor, county population, was multiplied by county St. Augustinegrass percentages, and the sum of products was divided by the total statewide population estimate. The population estimate was the average of the 1986 population estimate and a 1990 medium-growth population projection (12).

### Results and Discussion

The average reported St. Augustinegrass area was 41% of all turf areas, on a county basis. Densely populated urban counties were reported to have a higher proportion of St. Augustinegrass than were less populated rural counties. St. Augustinegrass area estimates, weight-averaged for population, were 64% of established turf areas in Florida. This was consistent with an early report which stated, "St. Augustine grass is the most common lawn grass in Florida" (4).

Most county agents (85%) reported chinch bug damage to St. Augustinegrass (Fig. 1). County agents considered chinch bugs as the major insect pest of St. Augustinegrass,

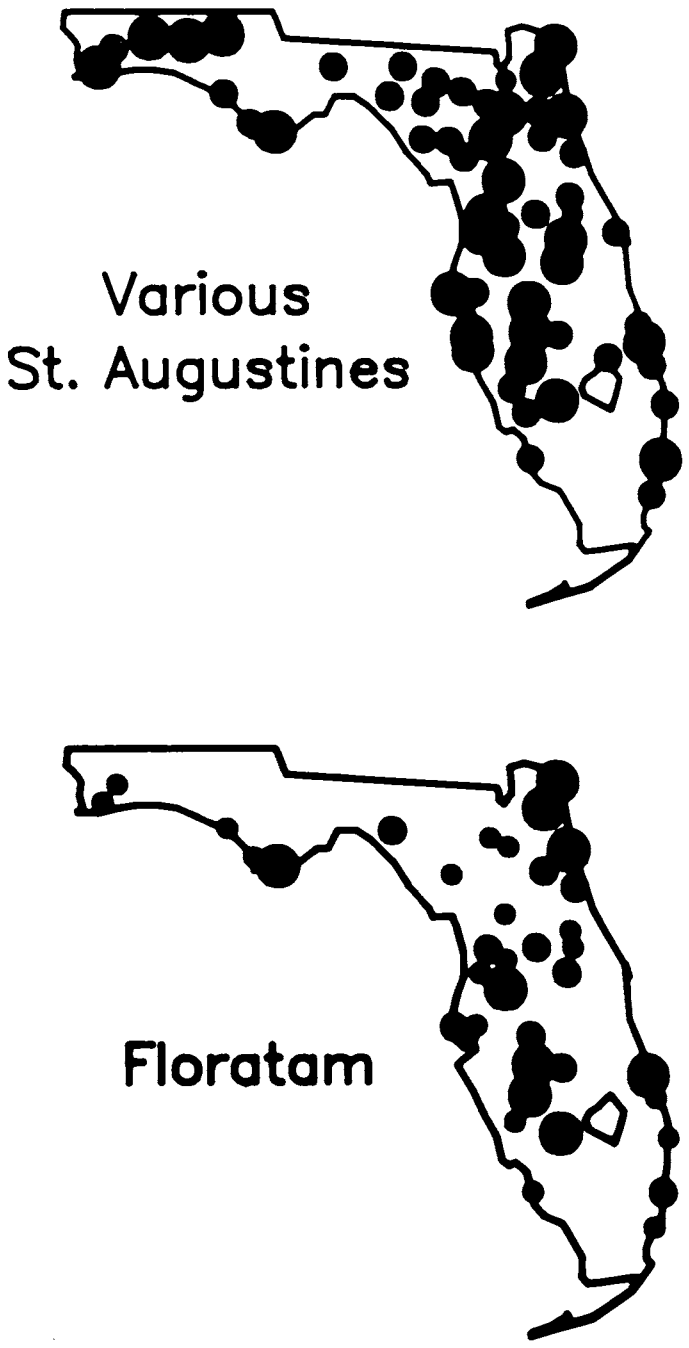


Fig. 1. Distribution and size of chinch bug damage to St. Augustinegrass turf as reported by 67 county extension agents. The size of the circles indicates the size of damaged patches: small circles, small damaged patches < 1 ft diam; medium circles, medium damaged patches < 10 ft diam; large circles, large damaged patches ≥ 10 ft diam. Counties reporting no damage, 10 and 30 for various St. Augustinegrass cultivars and Floratam, respectively, are not represented.

while sod producers considered chinch bugs as slightly less important than caterpillars (Fig. 2).

A majority of sod producers, 53%, reported that chinch bugs had damaged Floratam on their farms, and 43% indicated that pesticide treatment had been needed against chinch bugs in Floratam. A similar frequency of county agents, 55%, responded that Floratam had been damaged, and 49% indicated that pesticide treatment had been needed for chinch bugs in Floratam. The size of chinch-bug damaged patches observed in Floratam was generally small compared with that reported in various St. Augus-

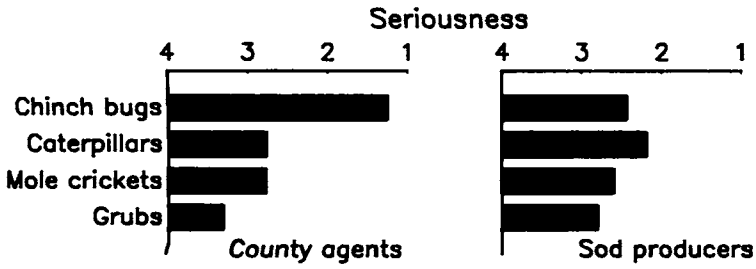


Fig. 2. Relative seriousness of insect pests of St. Augustinegrass turf (1 = most serious, 4 = least serious; average ranks of responses from 64 county agents and 22 sod producers).

tinegrass cultivars (Fig. 3). The distribution of Floratam-killing chinch bugs was widespread. Neither county extension agent responses (Fig. 1) nor sod producer responses (data not shown) revealed any obvious geographic pattern. County extension agents frequently (15%) qualified responses that cultivar identification was uncertain.

Regarding the nature of the chinch bug problem in St. Augustinegrass, county extension agents emphasized lost turf and reduced quality, whereas sod producers were more evenly concerned about six different factors, including several marketing questions (Fig. 4). While not defined in the questionnaire, the context of two factors, "uncertainty" and "no guarantee" would relate to the subject of reliability, i.e., resistance against chinch bugs. The main chemical controls against chinch bugs were diazinon and chlorpyrifos, equally recommended (county agents) and chlorpyrifos (sod producers).

The most frequent management recommendation by extension agents (13% of counties) for dealing with the chinch bug was to provide monitoring and early diagnosis and treatment of chinch bug problems in St. Augustinegrass. It was occasionally (9%) suggested to provide proper water management, to prevent stress in the turf. It was also occasionally (9%) mentioned to provide lower fertilization, especially to reduce soluble N, and especially in the summer growing months. This was consistent with previous reports (13) associating high damage by chinch bugs with high rates of highly soluble N.

Chinch bugs were reported as pests of other grasses in seven counties, primarily located in west central Florida (Tampa bay region) and in the Panhandle (contiguous with the Appalachicola River). Grass crops mentioned as hosts were common bermudagrass (*Cynodon dactylon* (L.) Pers.); carpetgrass (*Axonopus affinis* Chase); centipedegrass (*Eremochloa ophiuroides* (Munro) Hack.); grain sorghum (*Sorghum bicolor* (L.) Moench); pangola digitgrass (*Digitaria decumbens* Stent.); pearl millet (*Pennisetum americanum* (L.)

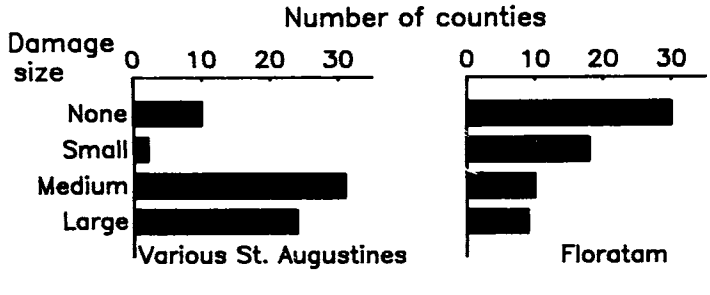


Fig. 3. Size of patches damaged by chinch bugs of various St. Augustinegrass cultivars compared with Floratam, number of counties reporting out of 67.

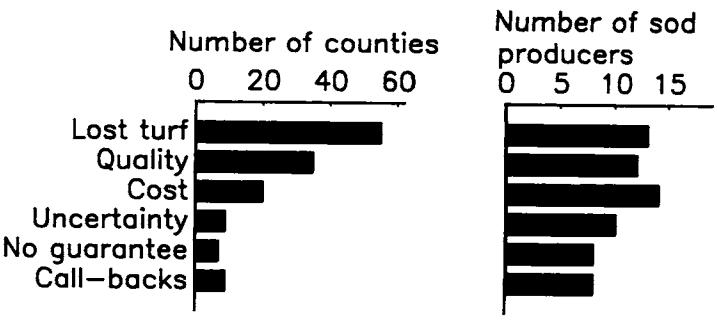


Fig. 4. The main problem(s) with chinch bugs in St. Augustinegrass, number of responses reported out of 61 counties and 19 sod producers.

Leeke); limpograss (*Hemarthria altissima* (Poir.) Stapf and C. E. Hubb.); rye (*Secale cereale* L.); stargrass (*Cynodon nlemfuensis* Vanderyst) and zoysiagrass (*Zoysia* sp.). Although St. Augustinegrass is commonly recognized as the primary host of southern chinch bugs in Florida, it is likely that alternative crop species, as well as weeds, could support southern chinch bug populations. This must be considered in studying the origin of chinch bug populations with varying host adaptation, for example the PDP southern chinch bug.

## Conclusions

The high damage potential and the resilience of the southern chinch bug must be considered in future research. St. Augustinegrass was shown to be the major turfgrass of Florida, and the southern chinch bug its most important insect pest in established areas. The status in 1988 did not differ from that which existed in 1929.

By 1988, the southern chinch bug had damaged Floratam in most counties of Florida, following the discovery of the PDP chinch bug in 1985. Considering the novelty of the PDP chinch bug and its unknown future course, a continuing plan of management and research will be needed. We believe that resistance breeding is feasible, and remains the most attractive solution. Other approaches, such as pesticides, biological control, and integrated management, will also continue to be worthwhile.

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# MOUNTS BOTANICAL GARDEN—ITS FUNCTION AND PURPOSE

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*ASTRACT.* **The Mounts Botanical Garden, a Palm Beach County facility, has been developed and operated by the IFAS Palm Beach County Cooperative Extension Service. Unique in its purpose as an educational tool in extension programing, the garden allows users to key identifications as well as visual ccmparisons of plant materials demonstrated within specific themes. In addition to extension program use, many cooperative events sponsored by commercial and amateur groups are held in the garden. This broad base of planned educational programming has provided the community with a focal point for horticultural activities.**

The role of an Urban Horticulturist within the Cooperative Extension Service is essentially one of disseminating information regarding plant material and related cultural requirements. Extension offices handle thousands of walkins and telephone calls annually, while giving out or mailing out corresponding amounts of printed fact sheets.

Most extension offices have attempted to incorporate common specimens of landscape material into their landscaping. This is done to provide a visual reference to questions regarding such plants. These small plantings work quite well in most locations, and this is the way the Mounts Botanical Garien came into being.

In south Florida however, two factors exist which complicate this simple method of demonstrating common landscape material. The first problem is the sheer diversity in plant material that can grow in this locale. Even in terms of what is considered common, that which is grown and sold in local nurseries is, in numbers, greater than anywhere else, worldwide. The second problem is the migrating masses of northerners to whom this multitude of subtropical and tropical plant material is, to say the least, quite confusing.

In Palm Beach County, land availability coupled with public and private sector support, has allowed for the gradual expansion of demonstration plantings into a formidable botanical collection. In a transition lasting now over twenty years, casual plantings of a few fruit trees has grown to an educationally oriented and organized botanical garden with approximately 12 acres of plantings.

A major redevelopment project was undertaken 2 years ago to establish continuity between previous plantings and a new, larger area of expansion. Of great importance in this redevelopment, is a management policy developed by the extension horticultural staff. Through this policy a defined purpose for the garden's existence is stated, with the support of extension programming as an assigned function. The policy states, in part:

> "To use plant material as an educational tool. To demonstrate the individual specimen's true form and function within the home landscape, plants will be planted to achieve a representative habit. Themes will be developed within the specific areas and be dedicated very narrowly to that group of plants of the demonstration theme."

By keeping demonstration themes as 'subject specific' as possible, a self-help concept is encouraged for visitors. Emphasis is put on grouping plants by landscape use, allowing visitors to make comparative decisions. Extension fact sheets are also 'subject specific', and when used in conjunction with garden visits, gives homeowners complete information on 'specific subject matter'. Fact sheet content is also important in devising demonstration plans, since all cultural and maintenance operations are carried out to IFAS recommendations where applicable.

Some of extension's associated plant societies actively participate in develpment, upkeep, and evaluation of plantings relative to the Society's interest. Individual societies hold plant sales, meetings, and workshops or demonstrations in the garden, and contribute greatly to public awareness of extension programming.

Other extension horticultural programs, such as the Master Gardener Program, utilize the garden for training in plant, plant disease, and insect identification. With just a quick trip from classroom to the garden, an instructor can offer 'hands-on' experience in virtually any horticultural subject.

Other extension program areas, aside from agriculture, also utilize the garden for programming. 4-H, the Extension's youth development program, holds special interest classes in the garden for subjects such as terrariums and dish gardens, plant propagation, tropical fruit culture, and much more. Also, the garden staff in cooperation with 4-H, has developed educational programs for school children that matches up with specific grade curricula. This program, offered for grades 1-6, involves activities or games which relate directly to the performance objectives