Resistant Varieties (James A. Reinert and Philip Busey)

The greatest damage by mole crickets in Florida is to turf and pasture grasses. Most significant is destruction of bahiagrass and bermudagrass by the tawny mole cricket and of bermudagrass and St. Augustinegrass by short-winged mole crickets. Resistant cultivars are needed in these instances as a safe, economical control

Table 3. Response of first instar nymphs of tawny and southern mole crickets contaminated with *Metarhizium anisopliae* conidia.

	Tawny mole cricket			Southern mole cricket		
Fungal strain*	Percent mortality	Mean time to death (days)	*M. anisopliae* sporulation**	Percent mortality	Mean time to death (days)	*M. anisopliae* sporulation
MATRW-20	100	10	100	100	6	100
MADA-24	100	4	100	100	5	100
MADA-31	0	0	0	100	5	100
MAPG-77	100	6	100	100	6	100
MARB-297	0	0	0	29	6	100
MARB-298	100	6	100	24	14	0
MARB-456	100	9	100	42	5	100
MADS-472	100	10	60	53	14	20
MC-3057	100	4	0	—	—	—
MC-3059	40	13	0	—	—	—

*Spores applied to soil at a rate of 0.5 mg/g soil.
**Percent dead larvae producing spores.

strategy. The potential role of turf and pasture as alternate hosts for mole crickets invading vegetables and other corps must also be considered. We have, therefore, evaluated turfgrass cultivars and species for resistance to pest mole crickets. We have included an evaluation of promising germplasm and prospective cultivar releases for mole cricket resistance, in some cases supporting cultivar releases with timely information on genetic vulnerability to mole crickets.

Bermudagrass selections

Most of the bermudagrass cultivars grown as turfgrass were evaluated for resistance to adult tawny mole crickets (Table 4) in two experiments in screened field cages (Fig. 19). This mole cricket damages bermudagrass by feeding on the roots and leaves, and by loosening and uprooting the plants as it tunnels. Feeding damage in these experiments was characterized by extensive severing of upright leafy shoots from the spaced, container-grown transplants. Damage estimates were based upon visual ratings and relative reduction in harvested plants.

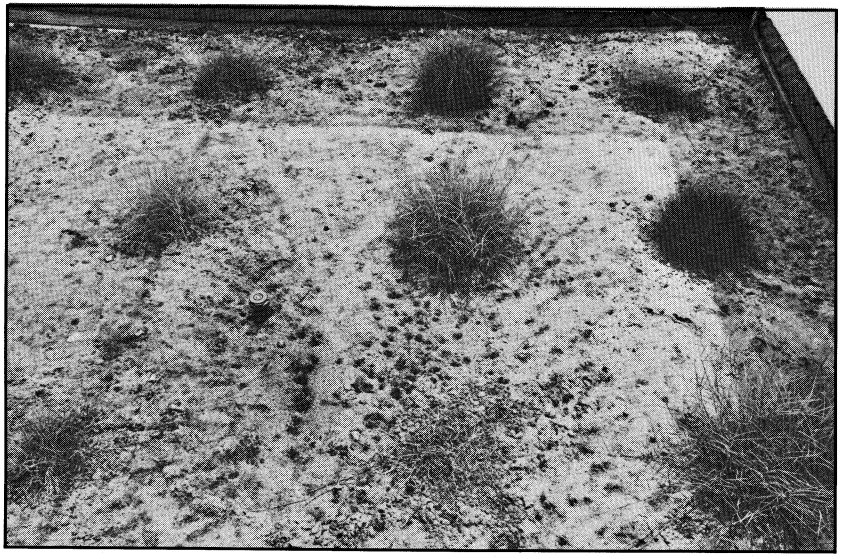

Fig. 19. Plugs of bermudagrass cultivars and selections in test for resistance to mole crickets (Table 4). Plugs were planted in replicated, paired, screen cages ($10 \times 10 \times 7$ ft, L × W × H). Adult mole crickets were introduced into one of each cage pair and allowed to feed. Damage estimates were made by comparing shoot harvests of plants grown with mole crickets to those grown without. (Note high preference for 'Texturf 10,' lower center, compared to several of the other selections.)

Table 4. Tawny mole cricket damage and growth reduction to bermudagrasses in field cage experiments.

Bermudagrass genotype	Dry wt. reduction of clippings*	Visual damage rating**	Resistance score†
	Experiment #1		
PI-290659	−3 a	6 a	99
FL-2400	6 ab	6 a	94
PI-291586	7 ab	13 ab	90
Ormond	22 ab	13 ab	83
Santa Ana	25 ab	12 ab	82
T-72-54	24 ab	14 ab	81
Tifway	22 ab	16 ab	81
Tifway II	19 ab	30 ab	76
Tifgreen II	37 ab	14 ab	75
FB-109	29 ab	25 ab	73
FB-119	31 ab	25 ab	72
U-3	38 ab	37 abc	63
Tifdwarf	36 ab	52 bc	56
Tifgreen	38 ab	52 bc	55
Sunturf	62 b	74 c	32
	Experiment #2		
Tifgreen	3 a	21 ab	88
Ormond	23 ab	8 a	85
Sunturf	18 a	24 abc	79
Midiron	28 abc	14 a	79
Hardy	29 abc	21 ab	75
FB-119	45 abcd	13 a	71
Tiffine	38 abc	28 abc	67
Tufcote	44 abcd	32 abc	62
Northrup King 78098	43 abcd	33 abc	62
Tifway	44 abcd	30 abc	63
Pee Dee	54 abcd	32 abc	57
Everglades	71 bcd	29 abc	50
Tuffy	71 bcd	30 abc	50
Texturf-1F	79 cd	53 bc	34
Texturf-10	92 d	55 c	27

SOURCE: Taken in part from Reinert and Busey (in preparation).

NOTE: Data reflect average of four replications. Letters after figures in middle columns show statistically significant differences. Only those figures in the same column and experiment that have no letter in common are significantly different.

*All foliage was removed at or just above ground level (check and mole cricket-inoculated plants treated alike). Reduction due to mole crickets was figured on a percentage of control.

**Visually estimated percentage of dead or dying foliage.

†Resistance score $= 100 - \left(\frac{\text{clipping dry weight} + \text{visual rating}}{2}\right)$

All bermudagrass selections tested were damaged, but 'Ormond', FL2400, PI-290659, and PI-291586 showed the least damage in these studies. Conflicting results were produced with 'Tifgreen' and 'Sunturf' in the two experiments, whereas 'Tifway' and FB-119, also common to both studies, each received similar and intermediate damage. PI-291586 is curretly under consideration for cultivar release for use as low maintenance turf.

Several of the same bermudagrass cultivars were tested for resistance to the short-winged mole cricket. This species also fed extensively on the plants. FB-119, Ormond, and 'Common' were least damaged by this species while Tifgreen and Tifway were both severely injured. Tifgreen and Tifway are the principal bermudagrasses grown on Florida golf courses, and both are severely damaged by mole crickets under field conditions.

Bahiagrass selections

Bahiagrass selections were evaluated for resistance to both the southern and tawny mole cricket. Twenty lines of bahiagrass, including 'Argentine' and 'Paraguayan', were tested against high populations of southern mole crickets in tank cages. This species does not feed extensively on grass plants but does most of its damage by uprooting the grass or loosening the soil around the roots, causing them to desiccate. Five experimental lines (FL-1950, FL-1962, FL-1990, FBA-20, and FBA-21) and Argentine sustained little or no damage in the study. All of these except FBA-21 produced more shoot growth when southern mole crickets were present than when they were excluded. Paraguayan and FBA-14 were the most damaged in the study, and the latter also showed severe damage in a field plot.

Eleven diploid, Pensacola-type bahiagrass selections were exposed to field levels of tawny mole crickets in screened field cages (Fig. 19) and sustained 59% to 88% damage within 11 weeks after inoculation with 4.8 mole crickets per square meter.

Comparison of species and cultivars of turfgrass

Field observations have suggested that mole crickets prefer certain species of warm season turfgrasses. When selections of St. Augustinegrass, bahiagrass, bermudagrass, centipedegrass, and zoysiagrass were exposed to populations of southern mole crickets, greatest damage was sustained by 'Bitterblue' St. Augustinegrass, Tifway bermudagrass, and 'Emerald' zoysiagrass, in descending order.

Other selections of St. Augustinegrass, bahiagrass, and bermudagrass were either not damaged or moderately damaged. A selection of centipedegrass was also moderately damaged. Among the selections of St. Augustinegrass, bahiagrass, or bermudagrass, those with the finest texture were most damaged, while the coarser selections were stimulated to produce more shoot growth in the presence of southern mole crickets.

Pasture grass selections

Pensacola and Argentine bahiagrass were also compared to four cultivars of *Hemarthria* grass in forced-feeding studies. Cultivars were 80 to 90% damaged by tawny mole crickets; 'Floralta' *Hemarthria* was the least damaged. However, southern mole crickets caused only 8 to 38% damage to the same grasses under the same conditions. Argentine bahiagrass showed little damage from southern mole crickets, possibly due to the mole cricket's greater preference for *Hemarthria*. Also, earlier tests with southern mole crickets, have shown that Argentine may be the least preferred of the bahiagrass types. In previous studies, 'Tifton 44' bermudagrass also exhibited tolerance to the southern mole cricket. Follow up studies have shown that in situations where Floralta is the only pasture grass available, mole cricket damage is as severe as might be expected in bahiagrass. Field testing of Tifton 44 has yet to be concluded. The possible resistance in Argentine bahiagrass also needs to be closely examined.

Host resistance potential for grasses

Field observations suggest that mole crickets prefer bahiagrass and bermudagrass. Mole crickets also show a preference for the finer textured selections within each grass species. Levels of resistance or tolerance to mole cricket feeding and tunneling damage have been shown within species of bermudagrass, bahiagrass, and St. Augustinegrass.

The relative contribution of nonpreference and host plant tolerance needs to be more carefully defined. Obviously, in a large monoculture such as a golf course or a pasture, nonpreference in the absence of other resistance mechanisms would be of limited economic value. Because the plants were widely spaced in these studies, inherent differences in density of growth among species were largely masked. However, potential for resistance has been documented, and further studies promise to identify cultivars that can be planted with substantially reduced risk of mole cricket damage.