



## FACT SHEET

Agriculture/Natural Resource Extension

Robert A. Kluson, Ph.D.

### **Long-lasting Control of Mole Crickets in Pastures Using Integrated Pest Management**

Here is useful information to all county residents who want to know about mole crickets and how to control their damage in improved pastures. These pastures can be intended for all types of livestock, including horses, cattle, goats, sheep, poultry, etc. This report focuses on the recommended controls using cultural and biological methods, as well as the approved chemical products. This up-to-date information is drawn from several sources by the UF Institute of Food and Agriculture Sciences (IFAS) and its research centers. Websites for all citations are given as references for readers to find more detailed information and photographs of mole crickets, their impact on pastures and the recommended control methods.

**What are mole crickets?** They are a family of insects related to crickets and grasshoppers. They have 3 growth stages to their life; eggs-nymphs-adults. They have no pupae stage. Mole crickets spend most of their lives underground. Their front legs are strong and adapted for digging, and they can dig into light soils remarkably rapidly. Their digging action is called tunneling. Both the nymph and adult growth stages are adapted for digging. (2)

Three species of non-native mole crickets were inadvertently introduced to the southeastern United States about 1900, and have caused serious plant damage. These are not the only mole crickets found in North America, but they are the most damaging. Two species of pest mole crickets are prevalent in south central Florida pastures, including Sarasota County. These are the southern and the tawny. Pasture grasses differ in susceptibility to injury. Bahiagrass is especially injured by mole crickets, whether grown as turf grass or as forage, though it is not clear if it is more attractive to crickets or more easily damaged. With stargrass and limpgrass, mole crickets have not been observed as being a considerable problem (3)

**What are the effects of mole crickets in pastures?** Extensive feeding by mole crickets on the roots and shoots of the grass at night and usually after rainfall mechanically damages the grass and increases the chance for drying out

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grass root systems and eventually bare soil. The tunneling produced by their digging behavior within the top few inches of the soil surface desiccates the soil and can cause the grass to wilt and eventually die. Initial damage to the pasture grass is indicated by thinning of the entire grass stand in small, isolated patches and in severe cases the grass will completely die in an entire area. Mole crickets actually make three kinds of cavities in the ground. Tunnels are the deeper mines they make in the ground. Galleries are the horizontal mines made just below the soil surface, causing the soil to bulge upward above the surface. The third kind of cavity is the egg chamber made by females. Once the mole crickets have damaged the grass, intense animal grazing under dry conditions also will add to the overall damage by further disturbing the roots. In addition, when entire patches of the grass die back, unwanted weeds could colonize this area.

**What factors influence pasture damage by mole crickets?** Florida's sandy soils favor their development and multiplication, and above all there are millions of acres of their favorite host grasses - bahiagrass and bermudagrass. Damage to bahiagrass is largely influenced by soil acidity and the amount of nitrogen fertilization which in combination can weaken the root-stolon system. Careful management practices to reduce overgrazing, reduce nitrogen (N) fertilization, and maintain a near neutral soil pH can be helpful in reducing severe mole cricket damage. For example, in Sarasota County the low N recommendation for grazed established bahiagrass pastures is 50-60 lbs/ac alone in the spring. (3). Compared to bahiagrass, damage to stargrass and limpograss is not influenced by fertilization and soil acidity (4).

**How are mole crickets controlled?** Long term pasture research in Florida has produced alternative controls that allow an integrated pest management (IPM) approach to controlling mole crickets. IPM is the recommended approach because pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment, while providing long-term prevention of pests.

The IPM control recommendations are based on a combination of methods, starting with monitoring then cultural, biological and, if necessary, chemical treatments. In preparation for the application of these treatment methods, please, take the time to use the educational resources of the online Mole Cricket Knowledgebase and Tutorials (5).

### Monitoring methods:

In order to control mole crickets it is essential to recognize their presence. It is difficult to estimate the size of mole cricket populations per unit area (e.g., numbers per acre) because these insects live underground, so cannot readily be seen and counted. Counting tunnels or galleries is an indirect and imprecise method of estimating populations. Nevertheless, by detecting the galleries they produce one can focus control efforts on the intensely infested areas in hopes of reducing the spread of the mole crickets.

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Several direct estimating methods of mole cricket numbers are available such as soil flushing, pitfall traps and sound traps but they can be very labor intensive. Soil flushing is the easiest and involves mixing 3 fluid ounces of dishwashing detergent in 5-gallon pail-full of water, and drenching 4 square feet with this solution. Observe the area for about 2 minutes and count the crickets as they surface. The threshold for turfgrass treatment is two to four mole crickets coming to the soil surface within three minutes of application of the soap solution. Remember that mole crickets tend to be distributed unevenly, so that samples have to be taken at many places per given acre, and the number of mole crickets per sample has to be averaged.

### Cultural methods:

A common cultural practice to reduce the amount of mole cricket damage is to monitor the amount of the grass leaf remaining to prevent significant plant stress. By leaving a "stubble" of the grass leaf remaining, this will allow for the plants to remain healthy and have a better chance at resisting mole cricket damage. In bahiagrass, damage can be reduced by leaving a stubble of 4 inches, but this is very hard to achieve in dry spring months. When trying to reduce the damage by mole crickets on any pasture grass, overgrazing by livestock should be avoided at all costs to decrease the risk of severe or permanent damage. In addition, depending on the type of grass planted, over fertilization should be avoided (as described above) and methods to maintain a healthy soil acidity for the grass should be considered.

### Biological methods:

1) UF/IFAS has developed and patented a biological control agent nematode (*Steinernema scapterisci*) can control these mole crickets without any risks to the environment or humans. These nematodes are beneficial and do not harm other plants or animals. They carry a bacterium that kills pest mole crickets within a few days after infection. This biopesticide is now produced by Becker Underwood, Inc., and is commercially available as "Nematac S". For successful application of this highly recommended biopesticide, please, consider the following factors:

- a) It's very important to remember that it is a live product and needs to be protected from excessive heat and light. For best results, the nematodes should be applied about ½ an inch below the soil surface with rain or irrigation to move it into the ground once it is applied. An ordinary sod-seeder can be modified into an application rig by adding a tank, a pump, hoses and nozzles. The nematode product should be premixed in a pail of water before adding it to the water tank. The sprayer mixture should be agitated and injected into the ground at the rate of 800 million nematodes per acre in 50-100 gallons of water. These nematodes were shown to persist and continue to kill pest mole crickets 8 years after being applied to a pasture in Florida.

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- b) The best time to apply the nematodes in south-central Florida is in the fall (September to November) or early spring (February to March) when adult tawny mole crickets are most abundant. While application is not restricted to those months, there is little surface activity by mole crickets in December and January as they "overwinter" deeper in the soil.
- c) While the initial cost of applying nematodes is comparable to insecticidal costs, the eventual cost is lower. The nematode has a residual effect and will be killing mole crickets long after insecticides have ceased to do so.
- d) Do not apply nematicides because these chemical can kill the mole cricket nematodes. Unlike nematicides, many other pesticides may be used the same day or within a short period before applying the mole cricket nematodes. Ask for instructions from the company applying the mole cricket nematode. Since the mole cricket nematodes are not chemicals, treated areas do not have to be closed to users after the nematodes are applied. (1)

2) UF/IFAS researchers have also developed and released an effective biological control agent wasp (*Larra bicolor*) that is now widely distributed across Florida, including Sarasota County. Adult Larra wasps attack mole crickets and lay eggs on them. The larvae of Larra wasps are ectoparasitoids of large nymphs and adults of mole crickets. They are specialists and will not successfully attack the native mole cricket. The Larra wasp is not an aggressive wasp and will not harm animals or humans unless intentionally bothered. The sting of the Larra wasp is unpleasant, but by no means as painful as that of paper wasps or bees. The wasp may sting if sat upon or disturbed in some other way, but simply standing in close proximity to it will not elicit aggressive behavior.

In order to successfully apply this recommended biological control Larra wasp, please, consider the following factors:

- a) Larra wasps can be attracted to your pasture by providing host plants that provide nectar for the adults. One such host plant is the wildflower called southern Larraflower or shrubby false buttonweed (*Spermacoce verticillata*). Therefore, the deliberate planting of this wildflower helps to sustain year-round Larra wasps populations in Florida. In time, as the Larra wasps population spreads, it will reduce mole cricket populations. As a result of the continuous spread and population increase of this wasp, there will be a reduction in the number of pesticide applications for mole cricket control. This biological control does not have a quick "knock-down" result but it's more permanent and is, in the end, a far cheaper method of control.
- b) Chemical sprays used to reduce pest mole crickets may have a detrimental effect on Larra wasps and other important insect populations. Therefore, if a pasture grass manager wants to use Larra wasps biological controls, insecticide applications may need to be reduced in some areas for Larra wasps survival.

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- c) Larraflower is a wildflower that is widespread in many counties in south Florida (6). Recently, it has been introduced to Sarasota County and seed is available free at the Extension Office. Deliberate plantings of Larraflower can be designed in underutilized areas of pastures, such as along fences and edges.

### Chemical methods:

Chemical control has recently lost its appeal when compared to using biological control agents because of the following factors:

- 1) Biological control provides permanent area-wide control once the organism is established, resulting in lower costs for the pasture manager in the future and a reduction in the release of harmful pesticides into the environment.
- 2) Controlling mole crickets with chemicals in pastures presents a problem to grazing animals, such as cattle, because using toxic insecticides may be harmful.

When biological controls are not established, the proper use of insecticides is an effective option. Liquid and granular formulations of insecticides are commonly applied to the soil to suppress mole crickets. In some cases, insecticide application should be followed by irrigation because the insecticide must enter the root zone of the plants to be most effective, but this is an insecticide-specific requirement so the insecticide label should be read carefully for application directions. Bait formulations are also useful. Various baits have proven effective, but most contain wheat bran, cottonseed meal, or some other grain product plus 2-5% toxicant. Mole crickets feed at night so baits should be applied in the early evening. Baits are incompatible with irrigation and rainfall. Lists and rates of approved insecticides are provided in the references. Proper use of insecticides requires following all label instructions and restrictions (2)

### **Where can I get further information?**

Please, use the websites listed in the references for further information. Also you can reach me by phone at (941) 232-3090 and by email at rkluson@scgov.net.

### **References:**

- 1) Adjei, M.B., W.T. Crow, G.C. Smart, Jr., J. H. Frank. and N.C. Leppla. 2006. Biological control of pasture mole crickets with nematodes. EDIS publication ENY-009. See the website - [http://edis.ifas.ufl.edu/IN123#FOOTNOTE\\_2](http://edis.ifas.ufl.edu/IN123#FOOTNOTE_2)
- 2) Buss, E.A. and J.C. Turner. 2004. Insect pest management on turfgrass. EDIS Publication ENY-300. See the website - <http://edis.ifas.ufl.edu/IG001>
- 3) Chambliss, C.G. and M.B. Adjei. 2006. Bahiagrass. EDIS publication SS-AGR-36. See the website <http://edis.ifas.ufl.edu/AA184>

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4) UF/IFAS Featured Creatures website. Mole crickets.

See the website -

[http://creatures.ifas.ufl.edu/orn/turf/pest\\_mole\\_crickets.htm](http://creatures.ifas.ufl.edu/orn/turf/pest_mole_crickets.htm)

5) UF/IFAS Mole Cricket Knowledgebase and Tutorials.

See the website - <http://molecrickets.ifas.ufl.edu/mcri0001.htm>

6) USF Atlas of Florida Vascular Plants – *Spermacoce verticillata*

See the webpage - <http://www.plantatlas.usf.edu/main.asp?plantID=1530>

Sarasota County Extension  
6700 Clark Road, Sarasota, Florida 34241  
(941) 861-5000; Fax: (941) 861-9886  
Website: <http://sarasota.extension.ufl.edu>

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