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# Lesser Grain Borer *Rhyzopertha dominica* (F.) (Insecta: Coleoptera: Bostrichidae)[1]

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*The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences. This publication is intended for the use of growers of stored products and anyone who may have stored products at home.*

## Introduction

***Rhyzopertha dominica*** (F.) (Coleoptera: Bostrichidae) is among the most damaging pests of stored grain in the United States (USDA 2016). Infestations can occur within industrial grain bins, food markets, or home pantries. While feeding on stored grains, adults bore holes into the kernels. Larvae can crawl into a kernel through these holes, causing further damage to the kernels by feeding on both the endosperm and germ. This loss of grain can result in devastating economic impacts and lead to secondary issues such as the growth of fungi, further compromising grain quality and integrity. Effective management strategies are crucial to mitigate these impacts.

## Distribution

Lesser grain borers (LGB) are native to the tropical regions of the Indian subcontinent. However, like many stored-grain pests, they have become globally distributed through transport and trade of stored grains. They are invasive in North America, South America, Europe, Africa, and Australia. While LGB are typically found in food stores in urban areas, they can also be found outside of grain bins, in wooded areas, where they can feed on seeds and acorns (Jia et al. 2008; Mahroof et al. 2010).

## Description and Life Cycle

Adults: Beetles are commonly dark brown to black, and among the smaller grain pests, at approximately 2 mm–3 mm (0.08 in–0.12 in) in length (Hagstrum et al. 2012). In total, development from egg to adult usually falls within 37–46 days. Mating can occur as early as 24 h following adult eclosion (Thompson 1996). Males produce a sex pheromone that is attractive to both males and females, thus males will attempt to mate with males, but females will not attempt to mate with females (Khorramshahi and Burkholder 1981). Both sexes can mate multiple times, and females cannot fertilize all of their eggs without multiple matings (Thompson 1996). Adult females may oviposit up to 500 eggs in their lifetime, between 33–45 per day.

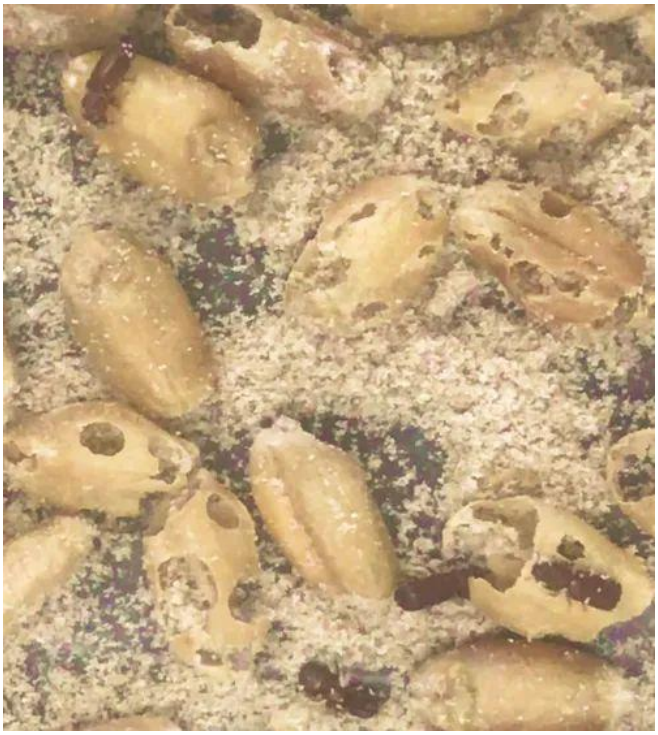

Figure 1. Adult lesser grain borers, *Rhyzopertha dominica* (F.), in damaged wheat.
Credit: Ethan Doherty (emdoher@clemson.edu), Clemson University, used with permission.

### Eggs

These can be oviposited outside the grain as single eggs or in clusters of up to 30 eggs (Edde 2012). Naik et al. (2016) found that at 28°C (82.4°F), egg hatch occurs after 4–6 days.

Figure 2. Adult lesser grain borers, *Rhyzopertha dominica* (F.).
Credit: John Obermeyer (obe@purdue.edu), Purdue Extension Entomology, used with permission.

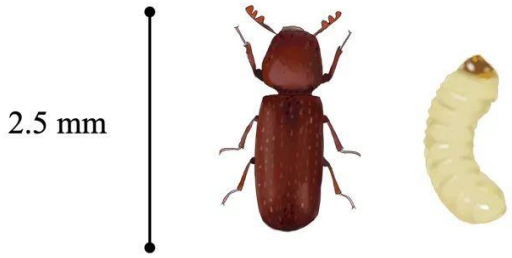


Figure 3. Artist renderings of adult and immature lesser grain borers, *Rhyzopertha dominica* (F.), with an approximate reference scale.
Credit: Drawing by Noelle Stephens, used with permission.

### Larvae

Once the eggs hatch, larvae emerge and seek the inside of a grain kernel, usually entering a kernel through injury to a seed's hull previously inflicted by an adult beetle. Once inside, LGB spend their development inside the grain. Development can occur between 18.2°C–39°C (64.76°F–102.2°F), while optimum grain moisture content is between 12%–14%. During this time the larvae feed upon the endosperm and germ (Birch 1953; Longstaff 1999).

### Pupae

Pupation usually occurs after 28–33 days of feeding, and adults eclose after another 5–7 days. Upon reaching adulthood they will leave an amorphous exit hole.

## Host Plants

Lesser grain borers feed on many types of seeds and cereal products. Common hosts include wheat (*Triticum aestivum*), corn (*Zea mays*), and rice (*Oryza sativa*), but are capable of surviving on all stored grains, and even wild seeds (Hagstrum et al. 2012; Jia et al. 2008; Mahroof et al. 2010).

## Economic Importance

Lesser grain borer is a major economic pest of numerous commodities, including wheat (*Triticum aestivum*), corn (*Zea mays*), rice (*Oryza sativa*), and other stored-grain products. Both adults and larvae cause direct damage to postharvest crops. Adults are capable of boring through the hull of grains and subsequently feed on the endosperm. The larvae are comparatively more damaging, as they consume both the endosperm and the germ. This damage often results in significant weight loss, which reduces grower income and the income of other stakeholders. Su et al. (2019) estimated that proper management of LGB could improve rice value by $0.35/kg ($0.16/lb), possibly more. If a shipment of grain is heavily damaged, the grain may be designated sample grade, or only fit for animal consumption, thus reducing its value. Stores that are infested at the time of shipment may require immediate treatment or the sale could be rejected.

Figure 4. A severe infestation of lesser grain borers, *Rhyzopertha dominica* (F.), in rice.
Credit: Ethan Doherty (emdoher@clemson.edu), Clemson University, used with permission.

## Management

### Chemical Control

Synthetic insecticides are the most commonly used control method in stored product pest management. Fumigants have been particularly popular because they are broad spectrum, fast acting, and leave little to no residue; and because they can be applied in vehicles in preparation for mills/shipment (Hagstrum et al. 2012). As such, they can be used to quickly respond to an infestation, whereas other insecticides are typically used to prevent infestations. However, overuse of fumigants has created fumigant-resistant populations of LGB, and so usage is limited (Hagstrum et al. 2012). Other stored-grain insecticides are applied to the grain bin or the grain itself for their residual activity. These can include neuromodulators or insect growth regulators. The neuromodulators, like deltamethrin or β-cyfluthrin, impair the nervous system functions of the insect by preventing the closure of their neuronal voltage-gated sodium channel. The insect growth regulators, like methoprene, disrupt insect development and fertility by mimicking juvenile hormone, an important regulatory hormone. These insecticides can remain

effective against the beetles for over a year. Consult with local Extension agents for a list of available chemicals.

### Biological Control

While they are understudied, there are natural enemies of LGB in stored-grain systems. Among the predators that occur in the US, *Xylocoris flavipes* (Reuter) (Hemiptera: Anthocoridae) is perhaps the most well-studied. Like many stored-grain pests, *Xylocoris flavipes* has spread across the world. *Xylocoris flavipes* is a generalist predator, feeding on numerous stored-grain pests, including LGB (Imamura et al. 2008; Parajulee and Phillips 1993). Similarly, *Theocolax elegans* (Westwood) is perhaps the most prominent parasitoid of LGB in the US. It is a generalist parasitoid of stored-grain pests, attacking the immature stages of LGB. Pathogens, like *Beauveria bassiana* (Bals.) Vuill., are also effective control agents for this pest.

### Cultural Control

The foremost method of cultural control is sanitation. Within homes or storefronts, infestations are best removed by disposing of affected grain. For large grain bins, cleaning the bin after it is emptied removes potential sources of beetles. Grain bins may also make use of temperature control and management of grain moisture content. Lesser grain borer development will fail at particularly low moisture contents, less than 8% (Birch 1953); however, moisture content that is too low may deteriorate grain quality. Moisture contents are often kept around 12%–14%. Higher and lower temperatures outside the beetle's preferred temperature range may also slow or stop development. Finally, different varieties of the same stored grain may have differential susceptibilities to LGB, and thus, knowledge of the crop is important for anticipating potential pest pressure.

## Selected References


Birch LC. 1953. Experimental background to the study of the distribution and abundance of insects. Ecology 34:698–711. https://doi.org/10.2307/1931333

Edde PA. 2012. A review of the biology and control of Rhyzopertha dominica (F.), the lesser grain borer. Journal of Stored Products Research 48:1–18. https://doi.org/10.1016/j.jspr.2011.08.007

Hagstrum DW, Phillips TW, Cuperus G. 2012. Stored product protection. Kansas State University Agricultural Experiment Station and Cooperative Extension Service.

Imamura T, Murata M, Miyanoshita A. 2008. Biological aspects and predatory abilities of hemipterans attacking stored-product insects. Japan Agricultural Research Quarterly 42:1–6. https://doi.org/10.6090/jarq.42.1

Jia F, Toews MD, Campbell JF, Ramaswamy SB. 2008. Survival and reproduction of lesser grain borer, Rhyzopertha dominica (F.) (Coleoptera: Bostrichidae), on flora associated with native habitats in Kansas. Journal of Stored Products Research 44:366–372. https://doi.org/10.1016/j.jspr.2008.06.001

Khorramshahi A, Burkholder WE. 1981. Behavior of the lesser grain borer Rhyzopertha dominica (Coleoptera: Bostrichidae): male-produced aggregation pheromone attracts both sexes. Journal of Chemical Ecology 7:33–38. https://doi.org/10.1007/BF00988633

Longstaff BC. 1999. An experimental and modelling study of the demographic performance of Rhyzopertha dominica (F.). I. Development rate. Journal of Stored Products Research 35:89–98. https://doi.org/10.1016/S0022-474X(98)00014-9

Mahroof RM, Edde PA, Robertson B, Puckette JA, Phillips TW. 2010. Dispersal of Rhyzopertha dominica (Coleoptera: Bostrichidae) in different habitats. Environmental Entomology 39:930–938. https://doi.org/10.1603/EN09243

Naik HR, Mohankumar S, Onkara Naik S, Pallavi MS, Srinivasan MR, Chandrasekaran S. 2016. Influence of food sources on development period of Rhyzopertha dominica, Tribolium castaneum, and Sitophilus oryzae. Indian Journal of Plant Protection 44:63–68.

Parajulee MN, Phillips TW. 1993. Effects of prey species on development and reproduction of the predator Lyctocoris campestris (Heteroptera: Anthocoridae). Environmental Entomology 22:1035–1042. https://doi.org/10.1093/ee/22.5.1035

Su L, Adam BD, Arthur FH, Lusk JL, Meullenet JF. 2019. The economic effects of Rhyzopertha dominica on rice quality: objective and subjective measures. Journal of Stored Products Research 84:101505. https://doi.org/10.1016/j.jspr.2019.08.002

Thompson V. 1996. Biology of the lesser grain borer, Rhyzopertha dominica (F.). Bulletin of Grain Technology 4:163–168.

USDA. 2016. Stored-grain insect reference. Federal Grain Inspection Service.

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