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BEHAVIOR AND DAMAGE OF GOPHERS IN A BANANA PRODUCING AREA IN TABASCO

Pablo Ulises Hernández Lara
National Institute of Forestry, Agricultural and Livestock Research (INIFAP).
Huimanguillo Experimental Field
Huimanguillo, Tabasco, Mexico
https://orcid.org/0009-0000-6976-7574

Diana Rubi Ramos López
Popular University of the Chontalpa
Cardenas, Tabasco, Mexico
https://orcid.org/0009-0007-9653-34322

Fabiola Olvera Rincón
Colegio de Postgraduados Tabasco Campus
Huimanguilo, Tabasco, Mexico
https://orcid.org/0000-0003-2466-3856

Sergio Salgado Velázquez
National Institute of Forestry, Agricultural and Livestock Research (INIFAP)
Huimanguillo Experimental Field
Huimanguillo, Tabasco, Mexico
https://orcid.org/0000-0002-8443-3190
Corresponding author

Miguel Ángel Ramírez Guillermo
National Institute of Forestry, Agricultural and Livestock Research (INIFAP)
Huimanguillo Experimental Field
Huimanguillo, Tabasco, Mexico
https://orcid.org/0000-0002-8928-1835

Ángel Ernesto Morales Rodríguez
Popular University of the Chontalpa
Cardenas, Tabasco, Mexico
https://orcid.org/0009-0006-1163-6743

Oswaldo Tique de los Santos
Tecnológico Nacional de México
Huimanguillo Campus
Huimanguillo, Tabasco, Mexico
https://orcid.org/0009-0006-2407-2887

Braulio Alberto Mateos Gallegos
Tecnológico Nacional de México
Huimanguillo Campus
Huimanguillo, Tabasco, Mexico
https://orcid.org/0009-0008-4222-6741

Abstract: The gourd (Geomydae; *Orthogeomys*) is currently not considered a pest of economic importance and is not part of Epidemiological Surveillance Campaigns in Mexico, however, field damage is significant and the scenario in banana producing areas and other crops is alarming. The objective of the present study was to evaluate the behavior and damage caused by *Orthogeomys* spp. to male plantain plants c.v criollo in a plantain producing area in Tabasco. The methodology consisted of recording the activity of the gophers, counting the number of mounds, recording the dimensions of the tunnels and evaluating the damage to plants. The results showed that the number of overturned plants does not necessarily coincide with the total number of mounds per affected area, but any gopher activity can be capable of causing damage. It was testified that tuza is not a seasonal pest and can cause damage all year round, therefore, the intervention for its control in the banana crop should be permanent and not temporary. Finally, it is important to consider that plant population density, the type of banana species, the state of development of the crop, soil management, neighboring crops and the work that the latter receive, are related to the activity of rodents at certain times.
Keywords: Tunnels, mounds, integrated management, population density.

INTRODUCTION

In Mexico, banana cultivation is of economic, social and food importance, being the most consumed fruit of the basic food basket, since, being harvested throughout the year, it is always available in the market (Churchill, 2011, Arias et al., 2004). In recent years, a decrease in production has been observed due to environmental disturbances, phytosanitary problems and soil resource degradation; likewise, the increase in the

world's population forces the excessive use of resources and a high demand for food, which makes it necessary to optimize production (Pérez-Zapata et al., 2024). In Tabasco, banana cultivation is of great importance due to the area planted, the benefit to the local economy of families and the generation of employment that the crop offers.

Gophers (Geomydae; *Orthogeomys*) are rodents and are considered pests in some Central and South American countries. They are adapted to live in disturbed environments, due to natural causes or human activities, which allows them to thrive in close proximity to humans; and given that they are herbivorous organisms with subterranean habits, the relationship is usually detrimental to the economic activities of the population (Fernández et al., 2014). However, they contribute positively to the aeration and removal of soils, which is an important environmental service. Their ecological distribution is the result of the interaction of several factors. They prefer sandy soils, with low clay content and little slope (Ceballos and Oliva, 2005). In situations where they reach high densities, as a consequence of abundant food, higher birth rates and low mortality, the young disperse to sites not occupied by adults, which are generally lower quality habitats. When the optimal sites used by adults become available, due to their death or migration, young individuals replace them, thereby restarting the cycle of permanent invasion (Chávez, 2017). There are two alternatives to mitigate them: reduce their numbers, or make the plants they consume and the soils where they dig their burrows less attractive and accessible. Although there are many methods for their control, producers, in general, apply chemical (poisons) or mechanical (traps) methods, and use them once the problem arises. However, they have a strong impact on ecosystems and are not completely effective. The modification of the environmental conditions that favor the presence of these animals represents an option of minimum environmental impact and corresponds to a preventive action. That is, it should be used before infestation begins (del Villar-González, 2000). At present, the gophers are not recognized as a pest in Mexico, even though this rodent considerably affects various crops such as bananas, bananas, lemons, sugarcane, cocoa, among others. In agricultural activity, the damage is related to consumption of roots, bulbs, rhizomes and stem bark, in addition to causing losses of soil resources due to wind and water erosion. They are known by farmers because of the damage they cause to various crops, live fences and backyard crops, and because of their hypogeous habits they affect irrigation systems, pipes and wiring. Forestry production is affected by damage to the roots of recently established trees and in the productive stage of wood harvesting. Similarly, livestock production can be affected by the damage they cause to pastures and by the accidents suffered by cattle when they introduce their legs into the nests, causing breakage (Monge, 1999). In addition, they gnaw or bite irrigation and electric lines. Mounds can damage mowing equipment or affect cultivation practices. Tunnels can divert irrigation water, increasing erosion and reducing irrigation uniformity. The damage caused by these mammals can be very significant and substantial (NCAT, 2018). In Costa Rica, where the *Orthogeomys cherriei* species is found, losses of up to 80% have been estimated in banana, banana, cassava, maize and malanga crops (Siks and Vaughan, 1984; Sutherland et al, n.d.), 60 to 80% in cocoa and 50 to 60% in banana and cassava (Delgado, 1986). To date, gophers have not been satisfactorily controlled because their habits and behavior are not well known, which makes it difficult to control them. Losses in some crops are worrying and substantial, for

example, in banana-producing areas in the region of San Rafael, Veracruz, losses of up to 30% have been calculated in banana and banana crops, as well as in the municipalities of Nautla, Papantla, Atzalan and Tlapacoyan, belonging to the same entity (MS noticias, de Martínez de la Torre, Ver.). Banana growers in the Cucuyulapa production zone, belonging to the municipality of Cunduacán, Tabasco, recognize that there are problems caused by gophers that affect production units, due to an increase in populations in recent years. Currently, there is no research that explains the damage caused by these rodents in banana-producing areas in Mexico, so it is necessary to evaluate the problems caused by gophers in this crop, so this study can contribute to the generation of knowledge and thereby make better decisions in the management of banana crops in producing areas of Tabasco. The objective of this field study was to evaluate the behavior and damage caused to male plantain plants c.v criollo in a production zone in Tabasco.

MATERIALS AND METHODS

LOCATION OF THE STUDY AREA

The study was carried out in the town of Cucuyulapa, in the municipality of Cunduacán, Tabasco, Mexico (Figure 1), in a commercial plantain orchard c.v criollo of 1 hectare interspersed with date banana in the period from January 15 to April 20, 2025. The area is located at coordinates 17° 58', 23.2" N; 93°, 14', 32.2" W. This zone, as in most of the Tabasco territory (95%), has a warm humid climate with an annual average temperature that varies from 25 to 27°C, with a prevailing warm humid climate with abundant rainfall in summer (Am) (Garcia, 1973).

FIELD VISITS

The study was completely field-based in a 1-hectare commercial plantain orchard subdivided into four quadrants (Figure 2). Biweekly walks were conducted in the study area in order to recognize mounds and damage caused to plants. Gopher activity was recorded and the number of fresh and old mounds in the study area was counted. The vertical and horizontal diameter of the opening of the tunnels and the depth of the tunnels were measured with a flexometer, as well as the damage to plants.

DESIGN AND VARIABLES TO BE EVALUATED

An indirect method was used to know the average activity of gophers (Chávez, 2017). The variables recorded in the study were: 1. gopher activity, 2. maturity status and number of mounds (fresh or old), 3. tunnel mouth dimensions, and 4. upturned or weak plants.

RESULTS AND DISCUSSION

GOPHER ACTIVITY

At the beginning of the study, field visits were made where both fresh and old earth mounds were observed, showing the presence and activity of gophers at the site. According to the "tuzero" Mr. Francisco Custodio Flores (personal communication) and plantain growers in the area, gophers reproduce all year round with two peaks of reproductive activity and damage; the first from March to June and the second from September to December, they also mentioned that gophers show greater activity between 18:00 and 6:00 hours, which coincides with what Delgado, 1990 reported, where he mentions that the greatest activity occurs between 16:00 and 8:00 hours. The records of the number and state of maturity of the mounds, dimensions of the tunnel mouth and damage to plantain plants c.v. criollo derived from six biweekly evaluations are shown in Table 1.

Number and state of maturity of mounds, dimensions of tunnel mouth and damage to plants registered in a commercial plantain c.v criollo orchard in Cucuyulapa, Cunduacán Tabasco, from six biweekly evaluations in the period from January 15 to April 20, 2025.

According to what was evaluated, it was observed that the number of overturned plants does not necessarily coincide with the total number of mounds per affected area, but any gourd activity can be capable of causing damage. The total number of mounds recorded, both fresh and old, regardless of their stage of maturity, gives an idea that all tuza activity is capable of causing damage. It was also evident that during the study period (first peak of damage activity) there were overturned plants and others on the verge of overturning. Quadrant 2 registered greater activity of gophers, which can be attributed to the fact that there are date plantain plants interspersed with plantain c.v criollo, so it can be assumed that the roots of this species of plantain are more attractive as a food source, or the density of plants is greater. Also, on one side of this quadrant there is a tree reserve, which is not disturbed and therefore serves as a breeding ground for these animals. On the contrary, quadrant 3 showed less gopher activity, less construction of mounds and less damage to plants, possibly due to the low population density of plants in that area, which caused a shortage of food for the gophers, and the lower activity can also be attributed to the fact that there was greater labor activity in the plantation adjacent to that quadrant, especially irrigation application, which scared the animal away. It is important to mention that plant population density, the type of banana species, the state of development of the crop, soil management, neighboring crops and the work they receive, are related to rodent activity at certain times.

MOUND CONDITION

The tours of the study site made it possible to easily appreciate and distinguish the maturity of the mounds and to recognize the damage to the banana plants. In most cases, the mounds observed were located near the food source. It was observed that the mounds had an average vertical tunnel mouth diameter of 11.8 cm and a horizontal tunnel mouth diameter of 11.4 cm. Because of the similar dimensions of the tunnel, it is attributed that it may be the same species of gourd that is in the area causing damage. On the other hand, a tunnel depth of 32.6 cm was recorded, which coincides with Delgado, 1990, where he mentions that tunnels in banana cultivation have an average depth of 32.7 cm and a vertical diameter of the tunnel opening of 10.3 cm.

DAMAGE TO PLANTS

When the damage was recent, the affected banana plants showed little quantity of roots, and the corm was gnawed (concave), showing the marks of the incisors. It was observed that many of the damaged plants had a bunch or were in bloom, that is, they were plants that were in the productive stage, so the economic damage was evident. Personal communication from some banana and plantain producers in San Rafael, Veracruz, affirms that the flavor of the roots of banana plants in flowering stage or cluster development are more attractive to gophers, which makes the productive plant more vulnerable to attack, this coincided with what was observed in this study, because near the damaged productive plants there were young plants between three and six months of age without showing any damage. With the above, it is understood that gopher attack is more specific in plants in production than in young plants without calving.

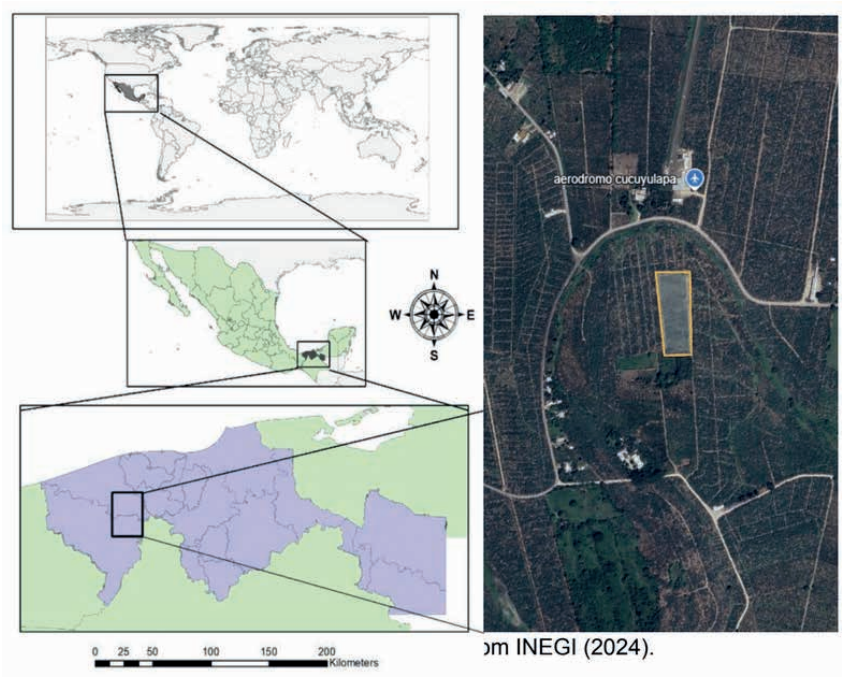

Figure 1. Geographical location of the state of Tabasco and commercial plantain orchard c.v criollo. Own elaboration with data from INEGI (2024).

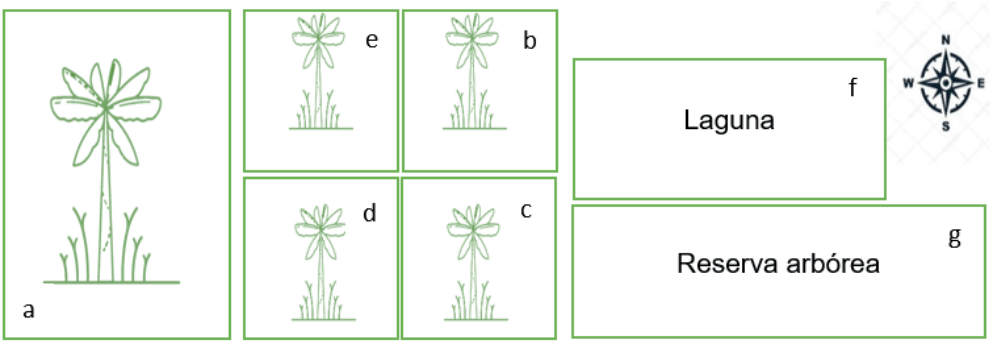

Figure 2. Delimitation of the commercial plantain orchard c.v criollo in a plantain producing area in Tabasco. a). Neighboring banana plantation with irrigation system and intensive management, b). Quadrant 1, c). Quadrant 2, d). Quadrant 3, e). Quadrant 4, f). Lagoon, g). Arboreal reserve.

Study area (1 hectare)	**Mounds**			**Dimensions (cm) of tunnel mouth (x̄ of 10 nests)**			**Damaged plants**
	Fresh	Old	Total	DV	DH	PROF	
Quadrant 1	10	28	38	12.0	11.8	31.7	21
Quadrant 2	18	108	126	11.1	10.9	33.8	36
Quadrant 3	2	6	8	12.3	11.1	35.2	4
Quadrant 4	4	15	19	12.0	12.1	30.0	6

DV: Vertical diameter, DH: Horizontal diameter, PROF: Depth

CONCLUSION

It was observed that the gophers are a serious problem in the plantain producing region of Cucuyulapa. The activity of this rodent confirms the need to look for new methods as alternatives to conventional control, so it is suggested to have integrated management strategies to reduce populations. The information obtained shows that the gopher is not a seasonal pest and can cause damage throughout the year. There are two periods of high reproductive activity and damage, therefore, the intervention for its control in the banana crop should be permanent and not temporary.

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