# INFLUENCE OF COVER CROPS ON DIVERSITY AND ABUNDANCE OF GROUND BEETLES IN TEXAS COTTON

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## Abstract

A two-year (2016-2017) field study in the southern Texas High Plains examined the activity of ground-dwelling predators in cotton as influenced by cover crops. A total of 2,298 predaceous beetles were recovered from pitfall trap samples. Seventeen species of ground-dwelling predatory beetles were found. While no significant differences were observed in beetle densities across three cropping systems, conventional production system appeared to have favored the activity of ground-dwelling predators in cotton in the Texas High Plains. Burying beetles, *Nicrophorus* spp., was the most dominant beetle species in our study in all three cropping system treatments, but the dominance was much more evident in conventional tillage system than in the two types of cover crop systems evaluated in this study. Additional data are being analyzed to examine the species diversity in these three cropping systems and their impact on pest management.

## Introduction

Predacious ground beetles are an important group of natural enemies in many cropping systems. Ground beetles feed on aphids, midges and flies, including coleopteran larvae as well as moths and caterpillars. Ecological factors such as temperature, soil cultivation, soil cover, organic fertilizer, and crop rotation affect ground beetle communities. Because most ground beetles are sensitive to ecological disturbances, including crop management practices (e.g., irrigation, tillage, planting date, pesticide application, harvesting), ground beetles are used as a bioindicator by which the health of the ecosystem is measured. Conservation tillage influences soil properties and microclimate, which consequently affect the dynamics of crop pests and their natural enemies. Because limited information is available on ground beetle diversity or population dynamics in cotton from the Texas High Plains, this study was designed to determine the species composition and seasonal activity patterns of predacious ground beetles in Texas cotton as affected by tillage practices.

## Materials and Methods

A two-year (2016-2017) field study was conducted at the Agricultural Complex for Advanced Research and Extension Systems farm, near Lamesa, Texas to examine the activity of ground-dwelling predators as influenced by cover crops (Fig 1). The experiment consisted of three cropping system treatments, including conventional tillage, rye cover-no tillage, and mix cover-no tillage) deployed in a randomized complete block design with three replications. Mixed cover crop species included hairy vetch (*Vicia villosa* Roth), Austrian winter pea (*Pisum sativum* L.), radish (*Raphanus sativus* L.), and rye (*Secale cereal* L.). Pitfall traps were made from 710-ml plastic drinking cups submerged in the soil (Fig 2). Two cups were installed in a cotton row of the middle two randomly selected rows in each of nine experimental units (plots); total nine plots and 18 pitfall trap sampling locations. The cups were filled to two-thirds of capacity with a water-detergent solution to aid in holding the beetles after falling into the traps. Sampling was conducted every two weeks (May to November) in 2016 and (May to September) in 2017 (Fig. 2). Dead beetles were collected, washed, dried, and identified in the laboratory.

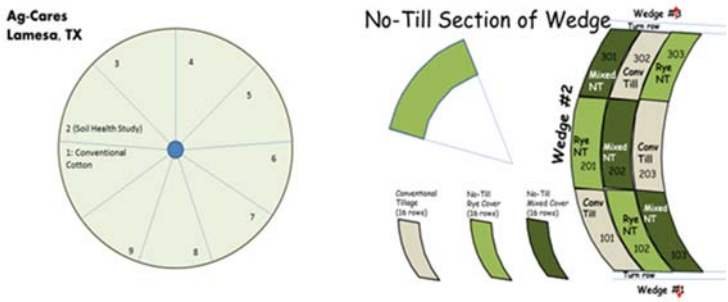


Figure 1. Location and experimental set up of the cropping system study, Lamesa, TX.

Figure 2. Installation of pitfall traps (left) and major species of ground-dwelling predatory beetles found in Texas cotton agroecosystems (right), Lamesa, TX.

## Results and Discussion

A total of 2,298 beetles in 17 species were recovered from pitfall samples during 2016-2017 (Table 1). More than 63% of the recorded samples belonged to genus *Nicrophorus* (burying beetles) which feed on carcasses of small vertebrates such as birds and rodents. While *Nicrophorus* spp. was the dominant beetle species in our study in all three cropping system treatments, the dominance was much more evident in conventional tillage system than in the two types of cover crop systems. Three of the recorded ground beetle species, *Cicindela* spp., *Calosoma* spp. and *Eleodes* spp., were the most prevalent predatory species (Fig 2). In both years, seasonal activity of ground-dwelling beetles (total beetle abundance reflected by pitfall traps) peaked in June-July and the activity declined as season progressed. While no significant differences were observed in predatory beetle densities across three cropping systems, conventional production system appeared to have favored the activity of the beetles in Texas High Plains cotton. It is possible that more ground beetles were recovered from conventional production system due to availability of relatively more prey in those systems, but the prey data were not recorded in this study. Additional data are being analyzed to examine the species diversity in these three cropping systems and their impact on pest management.

Table 1. Ground-dwelling beetle species recovered from pitfall traps, Lamesa, TX, 2016-2017.

1. *Phanaeus vindex* Macleay - Scarabaeidae
2. *Eleodes suturalis* (Say) - Tenebrionidae
3. *Eleodes hispilabris* (Say) - Tenebrionidae
4. *Calosoma affine* Chandoir - Carabidae
5. *Calosoma marginale* Casey - Carabidae
6. *Oxygrylius ruginasus* (LeConte) - Scarabaeidae
7. *Cicindela punctulata* Olivier - Carabidae
8. *Pasimachus* sp. - Carabidae
9. *Scarites* sp. - Carabidae
10. *Omorgus suberosus* (F.) - Trogidae
11. *Omorgus punctatus* (Germar) - Trogidae
12. *Canthon pilularius* (L.) - Scarabaeidae
13. *Eusattus* sp. - Tenebrionidae
14. *Tomarus gibbosus* (DeGeer) - Scarabaeidae
15. *Nicrophorus carolinus* (L.) - Silphidae
16. *Nicrophorus marginatus* F. - Silphidae
17. *Saprinus profusus* (Casey) - Histeridae

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## References

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