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Theme 2. Grassland production and utilization

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## Abundance, diversity and importance of some insects in grasslands of Indian arid zone

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### Introduction

Grasslands in arid regions are home to a large number of species of insects, which are well adapted to living in this ecosystem. Insects constitute a major part of the total faunal biodiversity of these grasslands and provide valuable ecosystem services such as pollination, decomposition, nutrient recycling, being important links in the food chain, *etc.* Diversity of entomofauna is a good criteria for judging the health of a grassland. However this diversity has not yet been properly studied. In the present study, attempt was made to unravel the diversity of some groups of insects in the grasslands of Indian arid zone. The results of this study have been presented in this paper.

### Materials and Methods

Survey was done at nine sites in CRF CAZRI Jodhpur, in the years 2012, 2013 and 2014. Sampling was done in three types of systems *viz.*, sole grasses, grasses with trees and grasses with shrubs for insects and other arthropods, including spiders. Sampling consisted of visual observations, beating tray and net collection. The collected insects were further, classified into different groups *viz* subterranean (saprophytic/ root feeders) and foliar (biting /sucking). Insects were identified to order, family and/or species with the help of photographs of specimens on NBAIR website/ books/ or comparison with earlier collected and identified specimens at CAZRI.

### Results and Discussion

The main species of grasses of arid region grasslands are *Cenchrus ciliaris*, *Lasiurus indicus*, *Cymbopogon jwarnacusa*, *Eleusine compressa* and *Aristida* species the important shrubs being *Calotropis procera* and *Zizyphus nummularia*. The major tree species of grassland of this region are *Prosopis juliflora*, *Prosopis cineraria*, *Acacia senegal* and *Salvadora oeooides*. Results of this study show that the arid region grassland entomofauna has high diversity and abundance of insect fauna. In this study, a total of 883 individual of insects from 8 Orders were collected. They are from the Order of Isoptera, Orthoptera, Coleoptera, Hemiptera, Hymenoptera, Lepidoptera, Mantodea and Odonata. The majority of insects found in these sites belonged to Orthoptera, Isoptera and Hymenoptera.

**Subterranean insects:** Termites and whitegrubs were the most important subterranean insects damaging roots of grasses and other plants in the Indian arid zone. Termites form the most dominant group causing damage to grassland plants, with the initial phases of plant growth more prone to insect attack. A total of 33 species of termites have been recorded from the Thar Desert (Ghosh *et al.*, 1996). *Odontotermes obesus* was the most commonly found termite species in the arid region the others being *Microtermes*, *Coptotermes* and *Eremotermes* sp. The larvae of many species of scarabaeid beetles (whitegrubs) especially those of *Holotrichia consanguinea* and *Anomala* sp. cause substantial damage to grasses roots. The subterranean feeders play a major role in nutrient recycling in grasslands of arid zones by consuming dead plant material, manure, and dead animals leading to increased nutrients in the soil which consequently improves the health of the grasslands. Termites, dung beetles, ground beetles are the major insects, which help in nutrient recycling. Termites, which are generally considered destructive insects, play an important role in recycling organic matter in arid grasslands. Some Scarabid and Carabid beetles species are saprophytic and feed on decomposing animal or plant matter and thus play an important role in recycling nutrient in the ecosystem. Ants (Hymenoptera: Formicidae) are another important group in grassland entomofauna. *Camponotus compressus* is the predominant species of Thar Desert. Ants are considered to be ecological engineers of grasslands as they aerate the soil, recycle nutrients and play a role in plant defense and seed dispersal and are food for lots of reptiles and birds. Some ant species support colonies of plant-feeding insects, such as aphids or plant hoppers, even protecting them from predator the diversity of the ant population is an indicator of the health of grasslands.

**Plant feeders:** Grasshoppers (Orthoptera: Acrididae) are the most important native herbivores and are the major insects of arid grasslands which cause foliar injury. Their outbreaks in the form of locusts is an important recurrent phenomena and has huge economic implications. The major types of grasshoppers are *Chrotogonus trachypterus*, *Hieroglyphus*

*nigrorepletus* and painted grasshopper *Poecilocerus pictus* are mostly found in arid grasslands round the year but maximum population was observed in August – September. Weevils *Myllocerus undecimpustulatus* and *Cyrtozemia dispar* also cause damage to grass leaves. Jassids *Amarasca*, *Empoasca* sp. also cause some defoliation to grassland plants. *Calotropis procera* and *Capparis decidua* are common in the arid grasslands. *Calotropis* shrubs supported a good diversity of insects. Catterpillars of monarch butterfly (*Danaus plexippus*) were the prominent defoliators of *Calotropis*. The *Calotropis* shrubs are attacked by aphids oleander aphids *Aphis nerii*. The *Capparis* shrubs support a good number of sulphur butterflies *Catopsilia* species. The eggs of *Catopsilia* were found to harbor good number of trichogammatids. Among tree components of grasslands, *Prosopis cineraria* is a common plant of arid landscapes. It is a host to a large number of insects, providing food, shelter and mating sites for these organisms. A majority of the insect species associated with these plants are not pests, causing no exerting no appreciable damage to the host plants. However, some of these insects do cause injury. Scarabid beetles feed on *Prosopis* leaves before egg laying in soil. *Prosopis cineraria* and *P. juliflora* leaves are frequently infested with whiteflies *Acaudaleyrodes rachiphora*.

**Predators:** The grasslands provide shelter and food to many insects predators such as ladybird beetles, ground beetles, syrphids, praying mantids and spiders. Many beneficial insects, which include lady bird beetles (*Coccinella septempunctata*, *Menochilus sexmaculatus*), syrphid flies and spiders were found in good numbers on *Calotropis* shrubs for preying on aphids. Carabid beetles (Coleopteran Carabidae), containing ground and tiger beetles, are important biological control agents in grassland ecosystems. They live on the surface of the soil where they prey on different types of soil dwelling insects, including caterpillars, wireworms, maggots, ants and aphids. Similarly various spider species such as are important predators of pest insects under arid conditions.

### **Conclusion**

Insects are enormously important group of organisms both in terms of numbers and types of species and the crucial role they have in ecosystem functioning and the global economy. The conservation of insect diversity is an important issue globally. Grasses, shrubs and trees of grasslands provide shelter and food for insects during non crop seasons. Grassland vertebrates such as birds, bats, rodents and reptiles are dependant these insects for their survival as they are important links in food chain. The loss of native plant species in grasslands due to overgrazing or cropping results in loss of resources required for survival of many insects. Undisturbed grasslands can serve as valuable reservoirs of insect diversity. Management of grasslands should consider this aspect so that the diversity of beneficial insects and vertebrates, which predate on harmful insects, is not disturbed.

### **References**

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