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Research Article

Seasonal Abundance Of Soil Inhabiting Arthropods In Forest And Agro Ecosystems In Warangal District

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ABSTRACT

Present study is based on seasonal diversity, habitat quality and species specific differences of micro and macro arthropods abundance in two different managed agro ecosystems at Gudurmandal Rajannapally village of Warangal district, Telangana State. Total 20 samples were collected from each site at monthly intervals. Soil macro arthropods were collected with the help of pit-fall trap method and identified by a binocular stereomicroscope. The results of this study stated that, the major invertebrate faunal groups recorded during study were collembolan, Arenea, Hymenoptera, Orthoptera, Acari, Dermoptera, coleoptera and Blateria. Climatic interference and edaphic properties are also affecting the diversity and species specific structure of soil macro arthropods community thus habitat quality may serve for static nature of soil macro arthropods diversity. Some insects provide natural population control of other insects, arthropods and vertebrates. Arthropods are very useful and helpful in many commercial and biological aspects like silk, lac & honey production. Hence, this study clearly establishes that diversity of soil macro arthropods is affected by various properties in an agro-ecosystems including qualitative and quantitative nature of external inputs, habitat quality, edaphic properties and regional climatic interferences..

1. Introduction

Soil arthropods are an important component of ecosystems, contributing significantly to their biodiversity and functioning, seasonal patterns, population dynamics, and functions of these insects. The biological characteristics consist of diversified communities of both micro and macro organisms, belonging to different groups of invertebrates. They are a diverse and functionally important component of forest ecosystems (P Zhao, C Song...et.al 2009). The activities of insects, such as ingestion, egestion, movement in search of food, mates, etc. help in various ecosystem processes, mainly litter decomposition and nutrient cycling (Zli, B Zou, Y Ding et.al., 2004) and other ecological processes like soil infiltration, (X Yin, W Zhong., et, al.,.2002), Soil Arthropods are good ecological indicators under changing environmental conditions effecting forest and agro ecosystems in the study area.

The present study was aimed to investigating the qualitative and quantitative composition and seasonal abundance of the soil inhabiting arthropods diversity in relation to the abiotic (physical) environmental factors in forest and agro ecosystems are reported.

1.1 Study Area

The study area is about 60 km away from Warangal city, a part of the Deccan plateau and is situated in the Telangana region of eastern part of Warangal district. The sampling and experimental sites of natural forest and agro ecosystems are located in the Pakhal wildlife sanctuary covering an area of 860 sq.kms. The forests of the sanctuary contain predominantly teak with miscellaneous species of plants supporting a number of both herbivorous and carnivorous animals and micro and macro arthropods of soil fauna.

And the forest areas have different types of trees, shrubs, climbers, grasses (*Madhucaindica*, *Pterocarpus*, *Marsupium*, *Bambusaarundinacea*, Maddi (*Terminaliaarjuna*), Beedi-leaf (*Diosyrosmelanoxylan*), *Asparagus racemosus*etc; DM Finch, 2012). In agricultural ecosystems crops; like Maize, Cotton, Chillies, Wheat, Mustard, and Sugarcane….etc, are being cultivated in this area. Blocks of 1.05 ha of different fields are selected from each sampling site for arthropod collection. The sampling is carried out for two consecutive years throughout the cropping season.

2. Materials and Methods

The soil surface inhabiting arthropods fauna of both forest area, and agro ecosystem, Warangal were sampled by pit fall traps and Tull-gren funnel methods.

2.1 Pit Fall Trap Method

In pit falltrap method wide mouth bottles of 24 cm length and 5 cm mouth diameter with 100ml of 5% formalin solution were placed as pit fall traps by digging into the ground randomly at ten places, the distance between two traps being 20 feets, in each habitat. A flat stone kept over each traps allowing a minimum distance of 2 cm, between the mouth of the trap and the under surface of the stone to protect the trap from rain and dust. These bottles were collected monthly during the study period. Besides, the traps were inspected morefrequently to avoid complete evaporation of formalin from the bottle due to the sun heat.

Figure-1. Pit fall Trap Method

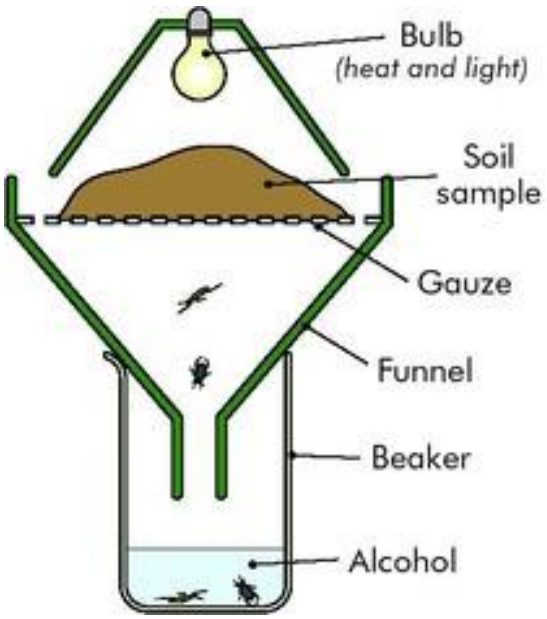

Figure-2. Tull-Gren Funnel Setup

2.2 Tull-Gren Funnel Method:

The Tul-lgren funnel works by creating a temperature gradient over the sample s such that mobile organisms will move away from the higher temperatures and fall into collecting vessel, where they perish and are preserved for further examination.

The traps after collections from the fields capped tightly and brought to the laboratory. The content of each trap was emptied in a Petri-dish. The soil invertebrates, both the micro and macro-arthropods were sorted under a dissecting stereoscopic binocular microscope. And also the soil temperature and relative humidity were noted on the field sites while analysis for soil pH, organic matter, and soil moisture contents were done in the laboratory.

3. Results and Discussion

A total of over 1724 soil inhabiting arthropods were collected from 80 samples in the two different altitudinal environments belonging to 8 orders were recorded in the study period of which Agro ecosystem contained 996 individuals of soil arthropods belonging to 8 orders. And forest ecosystem having 728 individuals with 6 orders.

Table-2. Percentage of soil inhabiting arthropods in two ecosystems

Order	Agro ecosystem Mean	S.E	%	Forest ecosystem Mean	S.E	%
Acari	**39.5**	**7.826**	**7.579**	**10.5**	**2.7**	5.76
Araneae	**84**	**26.83**	**19.14**	**20.5**	**2.78**	**11.26**
Blateria	**9**	**1.341**	**1.595**	**0**	**0**	**0**
Coleoptera	**18**	**8.049**	**0**	**10.3**	**1.19**	**4.25**
Collembolan	**43**	**19.23**	**11.43**	**58**	**0.63**	**23.9**
Dermoptera	**138**	**61.71**	**36.7**	**0**	**0**	**0**
Hymenoptera	**70.5**	**17.66**	**14.62**	**67.5**	**14.5**	**37.08**
Orthoptera	**96**	**12.96**	**8.909**	**32.25**	**5.5**	**17.71**

Table-1. Diversity of soil inhabiting arthropods in two ecosystems

Order	Agro ecosystem	Forest ecosystem	Total	Mean	S.D	S.E
Acari	79	42	121	60.5	26.16	5.849
Araneae	168	82	250	125	60.81	13.59
Blateria	18	0	18	9	12.72	2.844
Coleoptera	36	31	67	33.5	3.535	0.79
Collembolan	86	174	260	130	62.22	13.91
Dermoptera	276	0	276	138	195.1	43.62
Hymenoptera	141	270	411	205.5	91.21	20.39
Orthoptera	192	129	321	160.5	44.54	9.959
Total	996	728	1724			

In these ecosystems Dermoptera had maximum dominance in agroecosystem followed by hymenoptera. However dermoptera were not recorded in forest ecosystem. Blateria were recorded minimum number in agro ecosystem,but not recorded in forest ecosystem. Thus it is embededthat the different habitats with different vegetation encompassed with in the ecosystems are different in this soil inhabiting arthropod faunal characteristic.

Conflicting Interests

The authors have declared that no conflicting interests exist.

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