

Insect Diversity and Association with Plants: A Case Study in Rural Areas of Dhirkot, Azad Kashmir Pakistan

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INSECT DIVERSITY AND ASSOCIATION WITH PLANTS: A CASE STUDY IN RURAL AREAS OF DHIRKOT, AZAD KASHMIR PAKISTAN

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ABSTRACT

Insects play a vital role for proper functioning of forest ecosystem, including positive roles as pollinators, seed dispersers, genetic linkers and detrimental effects by feeding on and/or killing trees. The present study was conducted to find insect association with plants in rural areas of Dhirkot. The study was conducted from March, 2019 to September, 2019. The sampling was carried out by line transect method. Thirty transects were taken for sampling insects. Sixty-five species of insects in association with 150 plants were recorded.

Keywords: Insect, predator, carnivore, diversity, plants

INTRODUCTION

The forest ecosystem is facing a number of challenges such as anthropogenic pressures (wood-cutting, urbanization and land-use change), climatic changes, environmental issues, invasive pest and forest management that disturb forest health and/or structure and affect primary productivity (FAO, 2005). Insects play a vital role for proper functioning of forest ecosystem, including positive roles as pollinators, seed dispersers, genetic linkers and detrimental effects by feeding on and/or killing trees. Thereby, increasing net primary productivity of a forest by their activity (Mattson and Addy, 1975).

The vegetation of an area provides an ecosystem to insects and hence, factors that affect diversity and density of vegetation, affect the population of insects. The interaction between forest fires and insect pest outbreaks has been researched on for quite a while now. Parker et al. (2006) reviewed the interaction between forest fires

and insect populations and concluded that environments where fires have been curbed, tend to have a greater insect activity.

Previous studies on class insecta from Azad Jammu and Kashmir include studies on butterflies (Faiz et al., 2015), on insect biodiversity in District Rawalakot, AJK (Faiz et al., 2018), on moths (Faiz et al., 2019) but the present study is designed to find association of insects with plants. The present study provides baseline data about insect association with plants in rural areas of Dhirkot, AJK.

MATERIAL AND METHODS

Study Area

Dhirkot is a mountainous landscape and tehsil head quarter of district Bagh, Jammu and Kashmir. It is located towards southeast of Muzaffarabad and has Islamabad to its west. The vegetation of the study area varies from subtropical humid to moist temperate coniferous forest. Most of the flora

present includes *Pinus roxburghii* (Chir Pine) and *Pinus wallachiana* (Blue Pine) with variety of herbs, shrubs, grasses and mosses.

Sample Collection

The insect sampling was conducted by quadrat method in different vegetation types. Quadrats were taken on patrolling

paths at a distance of one km. The sampling was conducted from 7.00 am to 11.00 am. Specimens were collected through insect net and kept in ethyl acetate bottle and shifted to insect box. The collected insects were identified by following keys (Roberts, 2001). For rare species of insects opportunistic sampling in rare habitats was conducted.

RESULTS

Table 1. List of pest species with their host plants

#	Family	Species name	Host Plants
1.	Lasiocamidae	<i>Malacosoma disstria</i> (Forest tent caterpillar)	Anacardiaceae, Annonaceae, Barringtoniaceae, Bischofiaceae, Casuarinaceae
2.	Crambidae	<i>Scoparia ambigualis</i> (Grass moth)	licorice weed, sweet broom, vassourinha
3.	Pterophoridae	<i>Gillmeria albertae</i> (Plume moth)	<i>Antirrhinum majus</i> , <i>Pelargonium x hortorum</i> <i>Lantanophaga pusillidactyla</i> , <i>Ageratina riparia</i>
4.	Tipulidae	<i>Tipulidae sp.</i> (Crane fly)	Ornamental plants
5.	Erebidae	<i>Dysgonia sp.</i>	<i>Dionaea muscipula</i> , <i>Aldrovanda vesiculosa</i>
6.	Chrysopidae	<i>Chrysopidae sp.</i> (Green Lacewings)	Solanaceae, <i>Utricularia Drosera</i> , <i>Dionaea muscipula</i> , <i>Zea mays</i>
7.	Pleciidae	<i>Nearctica plecia</i> (Love bug)	Cereal crops, Solanaceae, apple blossoms, honey locust trees, potato
8.	Chrysomelidae	<i>Lilioceris lillii</i> (Scarlet lily beetle)	Blueberry, Wasps, Polistes Carolina
9.	Amorphoscelidae	<i>Gyromantis Kraussi</i> (Bark mantis)	Sunflower, Sorghum, sudan grass, corn, barley
10.	Uraniidae	<i>Urania leilus</i> (Green banded Urania)	Omphalea
11.	Melioidae	<i>Lytta aenea</i> (Blister beetles)	Amaranthaceae, Asteraceae, Leguminosae
12.	Blattodeae	<i>Blattella germanica</i> (German cockroach)	Sugar beets, potatoes
13.	Papilionidae	<i>Papilionidae sp.</i> (Swallowtail butterflies)	Aristolochiaceae, Annonaceae, Lauraceae, Rutaceae, Umbelliferae
14.	Miridae	<i>Miridae Sp.</i> (plant bug)	herbaceous plants, vegetable crops, flower plants, fruit trees
15.	Pieridae	<i>Colias croceus</i> (Clouded yellow butterfly)	Ginger, turmeric
16.	Lympyridae	<i>Arachnocampa Luminosa</i> (Glow worm)	Midges, Mayflies, Caddish flies, Mosquitoes, Moth.
17.	Sphingidae	<i>Bombycoidea sp.</i> (Hawk moth)	Soybean
18.	Sesiidae	<i>Melitta sp.</i> (Wasp moth)	Lotus, Coronilla, Hippocrepis, Onobrychis, <i>Prunus spinosa</i>

19.	Araneidae	<i>Neoscona Crucifera</i> (Barn spider)	<i>Trypargilum politum</i>
20.	Nymphalidae	<i>Junonia orithya</i> (Blue Pansy)	<i>Annona senegalensis</i> , <i>Antirrhinum majus</i> , <i>Asystasia gangetica</i> , <i>Asystasia scandens</i> , <i>Buchnera linearis</i> , <i>Acanthaceae</i> , <i>Annonaceae</i> , <i>Labiatae</i> , <i>Plantaginaceae</i> , <i>Buchnera linearis</i>
21.	Crambidae	<i>Diaphania hyalinata</i> (Melon worm)	Cucurbita species, Cucumber, gerkin, cantaloupe
22.	Coreidae	<i>Leptoglossus occidentalis</i> (Western conifer seed bug)	Apocynaceae, Jimson weed, Oleander
23.	Erebidae	<i>Gynaephora selenitica</i> (Larch tussock moth)	Lotus, Coronilla, Hippocrepis, Onobrychis, Prunus spinosa
24.	Limacodidae	<i>Apoda limacodes</i> (Caterpillar slug moth)	Oak, black cherry.
25.	Nymphalidae	<i>Nymphalidae sp.</i> (Brush footed butterflies)	tree sap, Rotting fruits
26.	Pentatomidae	<i>Acanthosoma labiduroides</i> (Southern green stink bug)	<i>Hordeum vulgare</i> , <i>Cajanus cajan</i> , <i>Brassica nigra</i> , Glycine max, Cucurbitaceae.
27.	Lycidae	<i>Calopteron reticulatum</i> (Reticulated net winged beetle)	Mites, Small insects
28.	Pentatomidae	<i>Halyomorpha halys</i> (Stink bug)	Soybean, Spider flower
29.	Alydidae	<i>Alydus calcaratus</i> (True bug)	Blackjack Oaks
30.	Cicadellidae	<i>Cicadellidae sp.</i> (Leaf hoppers)	Grasses seeds
31.	Cerambycidae	<i>Cerambycidae sp.</i> Long-horned beetle	<i>Dioscorea bulbifera</i>
32.	Coccinellidae	<i>Harmonia axyridis</i> (Asian lady beetle)	Fruits
33.	Vespidae	<i>Vespula germanica</i> (European wasp)	Fruits, honey dew
34.	Libellulidae	<i>Pantala flavescens</i> (Globe skimmer)	Small shrimps, Termites
35.	Carabidae	<i>Carabus auratus</i> (Golden ground beetle)	Insects, snails, worms
36.	Sparassidae	<i>Palystes castaneus</i> (Huntsman spider)	Geckos
37.	Scarabaeidae	<i>Aphodius</i> (Scarabe beetle)	Roots of grasses
38.	Pholcidae	<i>Pholcidae sp.</i> (Daddy long legs)	Huntsman spider
39.	Ichneumonidae	<i>Ichneumonidae sp.</i> (Wasp moth)	plant sap, nectar, insects
40.	Papilionidae	<i>Ornithoptera sp.</i> (Birdwing)	Aristolochiaceae, Annonaceae, Lauraceae, Umbelliferae Rutaceae
41.	Lumbricidae	<i>Eisenia Fetida</i> (Wigglers larvae)	Insects
42.	Cetoniinae	<i>Cetonia aurata</i> (Rose Chafer)	Grapes, Raspberry, Strawberry, Apple trees
43.	Sphingidae	<i>Sphingidae sp.</i> (Hawk moth)	Buddleia
44.	Salticidae	<i>Phidippus audax</i>	Tobacco budworms, Tarnished budworms

		(Jumping spider)	
45.	Elateridae	<i>Melanotus sp.</i> (Click beetle)	flowering plants leaves
46.	Tetragnathidae	<i>Leucauge venusta</i> (Orchard spider)	small insects
47.	Cuclicidae	<i>Culiseta longiareolata</i> (Wigglers larvae)	pitcher plants
48.	Scarabaediae	<i>Scarabaediae sp.</i> (Scarabe beetle)	roots of grasses, crops, corn, sugarcane
49.	Araneidae	<i>Angulate Orbweaver sp.</i> (Orb weaver)	Leafhoppers, Small moths, Small flies
50.	Erebidae	<i>Eressa confinis</i>	food plants
51.	Lygaeoidea	<i>Oncopeltus Fasciatus</i> (Milkweed bugs)	Asclepias
52.	Coccinellidae	<i>Coccinellidae sp.</i> (Lady bird beetle)	Epilachna borealis, E. varivestis, Mulsant, Leguminosae, Cucurbitaceae
53.	Tettigonidae	<i>Tettigoniidae sp.</i> (Katydid)	leaf-eaters
54.	Pentatomidae	<i>Pentatomidea sp.</i> (Shield bug)	cotton plants
55.	Scarabaeidae	<i>Cotinis nitida</i> (Lamellicorn)	Grasses, Vegetables, Tobacco, Ornamental plants
56.	Stratiomyidae	<i>Hermetia illucens</i> (Soldier flies)	Decomposer
57.	Cerambycidae	<i>Phryneta spinator</i> (Fig tree borer)	Ficus carica, Carica papaya, Mangifera indica, Shorea robusta
58.	Calliphoridae	<i>Calliphora vomitoria</i> (Blue bottle fly)	Nectar plants
59.	Calliphoridae	<i>Lucilia sericata</i> (Green bottle flies)	Curry plant
60.	Theridiidae	<i>Parasteatoda tepidariorum</i> (Common house spider)	Insects
61.	Mantidae	<i>Tenodera sinensis</i> (Chinese mantis)	Herbaceous plants, Woody shrubs
62.	Acrididae	<i>Acrididae sp.</i> (Grass hopper)	Indian grass, Kentucky blue grass, Scribner panicum, Buffalo grass
63.	Nymphalidae	<i>Junonia Coenia</i> (Common buck eye)	willow trees
64.	Geometridae	<i>Hydriomena furcata</i>	Broom Gorse
65.	Formicidae	<i>Camponotus compressus</i> (Banded sugar ant)	Insects

DISCUSSION

Forest tent caterpillar (*Malacosoma disstria*)

This species is a pest for plants belonging to *Anacardiaceae*, *Annonaceae*, *Barringtoniaceae*, *Bischofiaceae*, *Bombacaceae*, *Capparidaceae*, *Casuarinaceae*, *Combretaceae*,

Elaeocarpaceae, *Flacourtiaceae*, *Geraniaceae*, *Gramineae*, *Guttiferae*, *Lythraceae*, *Melastomataceae*, *Meliaceae*, *Moraceae*, *Myrsinaceae*, *Naucleaceae*, *Polygonaceae*, *Punicaceae*, *Rhamnaceae*, *Sapindaceae*, *Sonneratiaceae*, *Sterculiaceae*, *Tamaricaceae*, *Urticaceae* and the conifer families *Cupressaceae* and *Pinaceae*. The pest nature of *Malacosoma*

disstria has previously been reported by Anderson (1960).

trees and potatoes. The pest nature of *Miridae* sp. was also confirmed by Henry (1988).

Grass moth (*Scopariaambigualis*)

According to our findings, this species is a pest on licorice weed, sweet broom and vassourinha. The pest nature of *Scopariaambigualis* was also confirmed by Kristensen (1999).

Lovebug (*Nearctica plecia*)

Nearctica plecia is pest of blueberry. The pest nature of this species was also confirmed by Hardy (1958).

Plume moth (*Gillmeria albertae*)

In this study, *Gillmeria albertae* was observed as a pest on *Antirrhinum majus*, *Pelargonium x hortorum*, *Lantanophaga pusillidactyla* and *Ageratina riparia*. The pest nature of species (*Gillmeria albertae*) was also confirmed by Barnes and Lindsey (1921).

Scarlet lily beetle (*Lilioceris lili*)

Scarlet lily Beetle pest feeds on all sorts of plant tissues and all species are fully herbivorous. The pest nature of this species was confirmed by Whitman (2019).

Crane fly (*Tipulidae* sp.)

In this study, *Tipulidae* sp. Was found to be a pest for Ornamental plants. This pest nature of this species was also confirmed by Alexander and Byers (1981)

Green banded urania (*Urania leilus*)

Urania leilus was observed as a pest on plants belonging to the genus *Omphalea*. The pest nature of this species was confirmed by Barnes (2002).

***Dysgonia* sp.**

Dysgonia sp. was found to be a pest for *Dionaea muscipula*, *Aldrovanda vesiculosa*, *Utricularia* and *Drosera*. The pest nature of this species was also confirmed by Martiré and Rochat (2008).

German cockroach (*Blattella germanica*)

The German cockroach is a pest that feeds on sugar beets and potatoes. The pest nature of this species was also confirmed by Day (1996).

Green lacewings (*Chrysopidae*)

In this study, Green lacewings were found to be a pest on plants Solanaceae. The pest nature of this species was also confirmed by Bartlett (1964); Henry et al. (2002).

Swallow tail butterflies (*Papilionidae* sp.)

Papilionidae sp. are pests for plants belonging to *Aristolochiaceae*, *Annonaceae*, *Lauraceae*, *Rutaceae* and *Umbelliferae*. The pest nature of this species was also reported by Reed and Sperling (2006).

Plant bug (*Miridae* spp.)

Miridae sp. was found to be a pest of cereal crops, apple blossoms, honey locust

Clouded yellows (*Colias croceus*)

This species was observed as a pest for ginger and turmeric. The pest nature of this species was also confirmed by Bellows et al. (1992).

Glow Worm (*Arachnocampa luminosa*)

This species pest preys on midges, mayflies, and caddis flies. The pest nature of this species was also confirmed by Eisner et al. (1978).

Hawk moth (*Bombycoidea sp.*)

Bombycoidea sp. pest feeds on soybean plants. The pest nature of this species was also confirmed by Nieukerken; et al. (2011).

Wasp moth (*Melittia sp.*)

Melittia sp. pest feeds on lotus, *Coronilla*, *Hippocrepis*, *Onobrychis*, *Prunus spinosa*, *Vaccinium*, *Calluna* and *Rosa*. The pest nature of this species was also confirmed by Heppner (1981).

Blue Pansy (*Junonia orithya*)

Junonia orithya was observed as a pest on *Annona senegalensis*, *Antirrhinum majus*, *Asystasia gangetica*, *Asystasia scandens*, *Buchnera linearis*, *Misopates orontium*, *Justicia procumbens* and *Phyla nodiflora*. The pest nature of *Junonia orithya* also confirmed by Williams (1994).

Melon worm (*Diaphania hyalinata*)

Diaphania hyalinata pest feeds on plants belonging to *Cucurbita* genus with species such as cucumbers, gherkins and cantaloupe. The pest nature of *Diaphania hyalinata* also confirmed by Capinera (2000).

Western Conifer Seed bug (*Leptoglossus occidentalis*)

Leptoglossus Occidentalis is a pest on *Apocynaceae*, *jimsonweed* and *oleander* plants. The pest nature of this species was also confirmed by von Euw (1971).

Grass moth (*Scoparia ambigualis*)

Scoparia Ambigualis was found to be a pest on lotus, *Coronilla*, *Hippocrepis*, *Onobrychis*, *Prunus spinosa*, *Salix*, *Calluna* and *Vaccinium*. The pest nature of this species was also confirmed by Heppner (1981).

Caterpillar Slug moth (*Apoda limacodes*)

Apoda limacodes feeds on several genera of host plants such as those belonging to the genus *Quercus*. The pest nature of *Apoda limacodes* was also confirmed by *Apoda limacodes* (n.d.).

Brush-Footed Butterflies (*Nymphalidae sp.*)

The Brush-footed butterflies prefer tree sap or rotting fruit, some feed on dung or mud, rice weed, sweet broom and vassourinha. The pest nature of this species was also confirmed by Sabir et al. (2000).

Southern Green Stink bug (*Acanthosoma labiduroides*)

The Southern Green Stink bug feeds on *Hordeum vulgare*, *Cajanus cajan*, *Brassica nigra*, *Glycine max*, *Cucurbitaceae Juss* and *Gossypium*. The pest nature of this species was also confirmed by Prado and Zucchi (2012).

Stink Bug (*Halyomorpha halys*)

Halyomorpha halys was observed as a pest on soybean, spider flower. The pest nature of this species was also confirmed by Prado and Zucchi (2012).

True Bug (*Alydus Calcaratus*)

This species feeds on Blackjack oaks. The pest nature of this species (*Alydus*

calcaratus) also confined by Otavă et al. (1970).

Leaf Hopper (*Cicadellidae* sp.)

Leaf hoppers pest feed on Grass seeds. The pest nature of this species Leaf hoppers was confirmed by Lee et al. (2000).

Leaf Beetle (*Chrysomelidae*)

The leaf beetles feed on *Dioscorea bulbifera* and potatoes. The pest nature of this species was also confirmed by Radcliffe and Lagnaoui (2007).

Asian Lady beetle (*Harmonia axyridis*)

Harmonia axyridis was found feeding on fruits in this study. Graves (2013) describe this species as an insectivore that may also feed on alternatives that include fruits when their desired food is scarce.

Green Banded Urania (*Urania leilus*)

Urania leilus was observed feeding on *Omphalea diandra*. Green Branded Urania was also reported by Barnes (2002).

European Wasp (*Vespula germanica*)

The European wasp was observed to have a very diverse diet. They are known predators of carrion, live arthropods, fruits, honeydew, processed human food and garbage. The pest nature of this species was confirmed by Archer (1985).

Cucurbit stink Bug (*Coridus Janus*)

Coridus Janus is a pest for cucurbit family and damages crops. The pest nature of this species was confirmed by Stebbing (1903).

Moth caterpillar (*Gynaephora selenitica*)

Gynaephora selenitica pest feeds on Fabaceae species i.e. lotus, *Coronilla*, *Hppocrepis* as well as shrubs. The pest nature of this species was confirmed by Heppner (1981).

Lamellicorn (*Cotinis Nitida*)

Cotinis nitida was observed to pest feed on grasses, vegetables and ornamental plants. The pest nature of the Lamellicorn was also confirmed by Chittenden and Fink (1922).

Fig tree borer (*Phryneta spinator*)

In this study, *Ficus carica*, *Carica papaya*, *Mangifera indica* and *Shorea robusta* were observed as host species to the Fig tree borer.

Blues bottle (*Calliphora Vomitoria*)

Calliphora Vomitoria was observed to use plants with nectar as host. Wolf and Zouwen (2010) report the use of this species for pollination of cauliflower blossom.

Scarabe Beetle (*Scarabaeidae*)

In this study Scarab beetles were observed feeding on corn and sugarcane plants. Ratcliffe and Jameson (2005) cite scarab beetles to prefer dung in their diet but a variety of these prefer a vegetative diet that includes fruits.

Green Bottle flies (*Lucilia sericata*)

Green bottle flies were observed to feed on curry plant. Brodie et al. (2015) report *Lucilia sericata* to have significance as a pollinator as it is frequently observed near flowers.

Common house spider (*Parasteatoda Tepidariorum*)

In this study, species of *Acacia* were observed as hosts to the common house spider.

Chinese mantis (*Tenodera sinensis*)

In this study, woody shrubs and herbaceous plants were observed as hosts to the Chinese mantis. Kaltenpoth (2005) reported similar findings on habitat preferences of Chinese mantis.

Grasshopper (*Acrididae sp.*)

In this study, Indian grass, Kentucky bluegrass and *Scribner panicum* were observed as host plants for *Acrididae sp.* Song et al. (2018) cite them to be mainly vegetative in their diet.

Common buck eye (*Nymphalidae sp.*)

In this study, willow trees were observed as host plants to the Common buck eye. Daniels (2008) report a variety of plants (foxglove, toadflax and American Bluehearts) that act as hosts to the larvae of this species.

(*Hydriomena Furcata*)

Hydriomena furcata was observed on Broom gorse in this study. Bilberry, Salix and willow are some of the plants that are hosts to this species (*Hydriomena furcata*, n.d.)

Banded sugar ant (*Camponotus compressus*)

Camponotus compressus feed on honeydew produced by plant-sap-sucking insects like aphids and tree hoppers. Wood is not a part of diet of this species however, they do damage it to make nests (Carpenter Ants, n.d.).

CONCLUSION

In this study, sixty-five species of insects with an association to 150 plants were

recorded from Dhirkot. The results from this study may be used as a baseline for further ecological studies investigating interactions between insects and plants and studies focused on insect pest management.

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