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Diversity and abundance of agricultural Insect fauna of Mohacha village in Wazirpur tehsil, Sawai Madhopur, Rajasthan

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Abstract: *A study was organized on the diversity and abundance of insect fauna in agriculture lands of Mohacha village, wazirpur tehsil, Sawai Madhopur, Rajasthan. The present study was focused to determine the species richness, dominance and evenness of insect fauna from agriculture lands. The study was carried out during the month from May 2019 to October 2019. A total of 3426 insects from 7 orders, 31 families and 67 species were recorded. This study shows that Hymenoptera (37.04%) was the most dominant order according to total number of individuals, followed by Coleoptera (25.18%), Orthoptera (12.98%), Lepidoptera (8.11%), Hemiptera (6.27%), Isoptera (5.86) and Diptera (4.25%). The Simpson's Reciprocal Index diversity is highest in order Coleoptera (20.28) and lowest in order Isoptera (1.00). The species richness, evenness and diversity of insects were calculated by Margalef's Index, Pielou's Index and Shannon-Wiener Index respectively.*
Key words*: Insects, diversity, abundance, Wazirpur tehsil*

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I. Introduction:

The most diverse,dynamic and largestof animals group on the Earth is insects. Insects have been used studies in many streams of biology like entomology, environmental changes, forensic science, taxonomy, evolution and genetics because of their diversity, adaptability and variable characteristics (Jalali and Ojha, 2015). Universally, there are around 5.5 million insect species of which roughly 1.5 million species are coleopteran species (Stork 2018). India harbours roughly 63,760 species of insect belonging to 658 families related to 29 orders are known in India (Joshi et al., 2016; Sankarganesh, 2017). Rajasthan has a report of about 817 species belonging to 101 families under 13 orders, Odonata and Hymenoptera (Lelej, 1995; Bhardwaj et al., 2012; Bishnoi and Dang, 2019), Coleoptera (Kazmi and Ramamurthy, 2004; Sewak, 2010; Mohammad, 2017), Diptera (Kumar, 2004), Lepidoptera (Patol and Sonia,2001; Maulik, 2004), Isoptera (Rathore and Bhattacharyya, 2004; Rathore and Mandal, 2010), Orthoptera (Shishodia, 2004), Hemiptera (Thirumalai, 2002&2010).Research work was focused on the general diversity of insects; however, there is very scanty information available with regards to insect diversity study in Sawai Madhopur.

Insects are essential for human alive, because crops cannot be grown without the ecological functions provided by them. Diversity and composition of insects are mainlybased on vegetation and any substitute in the habitat is probably to have an effect on their distribution and relative abundance (Kerchev et al., 2012; Patil et al., 2016). Many insect species are serious pests of agricultural crops. Agriculture fields are comparatively more in danger to insect pest infestation due to the threat of diversified climatic situations. The larvae of insects are a voracious feeder and cause heavy loss to agriculture crops.Indian agriculture is nowadays suffering an annual loss of about US$. 36 billion caused by insect pests (Dhaliwal et al., 2015). Insect pests are associated to discrete agriculture crops, cereals, vegetables, woody plantsand ornamental plants. Almost fifty percent of insect species are a pest on crops (Schoonhoven et al., 2005). of which 18% species are herbivorous that forage on plants in many ways (Losey and Vaughan, 2006). The present study is significant to understand the diversity of agricultural significant Insects species in Wazirpur tehsil, Sawai Madhopur, Rajasthan, India.

II. Materials and Methods

A preliminary survey was accomplished for the residence of agriculture fields placed on the crop pattern and type. Taking out the through of the approachability and locality ofMohacha (26.65772° N, 76.91974° E) village ofWazirpur tehsil, Sawai Madhopur district and this site was visited monthly from May 2019 to October 2019. Research was based on direct observation and photo documentation along with handpicking, pitfall traps and light trapswere used for collection of insects. The light trap was used to collect the nocturnal insects.Pitfall traps were used for catching the ground walking insects. The collected insects were dry preserved for further identification in wooden boxes. Identification was done by usingpublished articlesand monographs.

Figure 1: Insects orders showing number of species in Mohacha village, Wazirpur tehsil, Sawai Madhopur, Rajasthan, India.

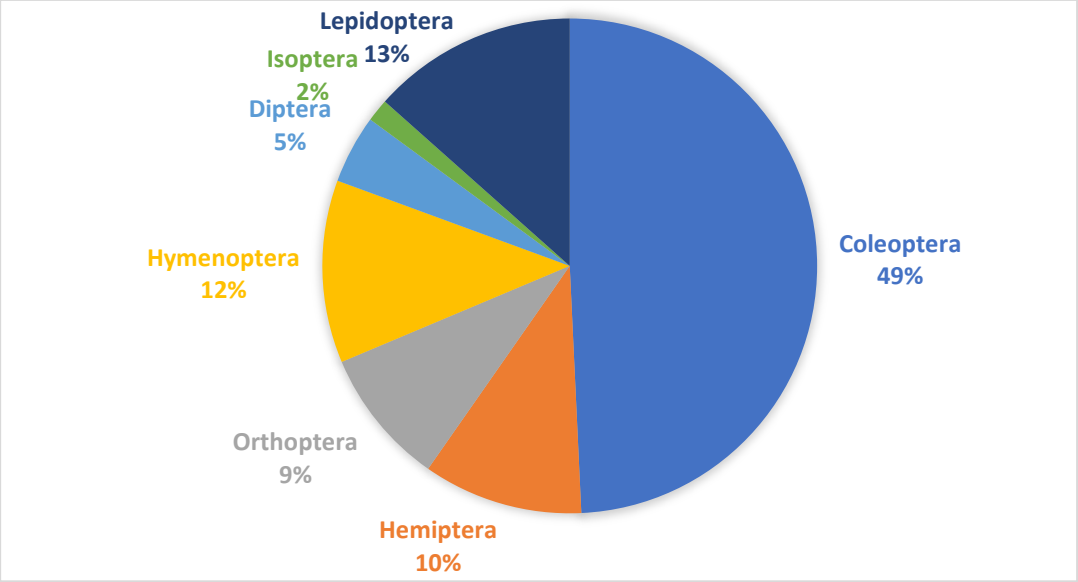

Table 1: List of insect fauna collected from Mohacha during from May 2019 to October 2019

Insect Order	Family	S.No.	Species	Total No. of Individuals
Coleoptera	Carabidae	1.	Pheropsophus sp.	78
		2.	Anthia sexguttata	8
		3.	Scaritesbuparius	12
		4.	Bembidionsp.	85
		5.	Calosomasayi	5
		6.	Chlaenius sp.	56
	Scarabaeidae	7.	Gametis versicolor	11
		8.	Maladera sp.	4
		9.	Onthophagus taurus	17
		10.	Catharsius molossus	13
		11.	Catharsiusphilus	48
		12.	Sericabrunna	25
		13.	Oryctes rhinoceros	2
		14.	Anomala sp.	36
		15.	Cyclocephala sp.	6
	Tenebrionidae	16.	Tenebrio molitor	55
		17.	Gonocephalum sp.	37
		18.	Eleodes sp.	2
		19.	Microderaconvexa	25
	Chrysomelidae	20.	Aulacophora sp.	29
		21.	Bruchus loti	9
	Buprestidae	22.	Sternocera basalis	34
		23.	Sternocera laevigata	42
		24.	Lampetis sp.	12
	Elateridae	25.	Lanelaterschottii	10
		26.	Agriotes sp.	19
	Bostrichidae	27.	Sinoxylon sp.	12
	Curculionidae	28.	Hyperapostica	28
		29.	Lixus sp.	49
		30.	Polydrusus sp.	9
	Meloidae	31.	Mylabrispustulata	43
		32.	Epicautafloridensis	7
	Staphylionidae	33.	Paederus dermatitis	35
Lepidoptera	Nymphalidae	34.	Danussp.	11
		35.	Hypolimnasbolina	19
	Papilionidae	36.	Papilio sp.	85
		37.	Papiliomachaon	45
	Pieridae	38.	Catopsilia sp.	63
		39.	Eurema sp.	6
	Pyralidae	40.	Plodia interpunctella	25
	Erebidae	41.	Lymantria sp.	21

	Sphingidae	42.	Agrius sp.	3
Hemiptera	Pentatomidae	43.	Nezaraviridula	25
		44.	Halyomorpha sp.	11
	Cicadidae	45.	Cicada sp.	89
	Coreidae	46.	Anasa tristis	21
	Derbidae	47.	Eocenchrea sp.	11
	Lygaeidae	48.	Oncopeltus sp.	4
	Membracidae	49.	Oxyrachis sp.	54
Orthoptera	Tettigoniidae	50.	Neoconocephalus sp.	33
		51.	Microcentrum sp.	6
	Acrididae	52.	Melanoplus sp.	29
		53.	Schistocerca sp.	302
		54.	Acrida sp.	67
	Grylidae	55.	Acheta domesticus	8
Hymenoptera	Apidae	56.	Apisdorsata	206
		57.	Apismelifera	314
		58.	Xylocopa violacae	16
	Formicidae	59.	Formica fusca	269
		60.	Tetraponera sp.	405
	Vespidae	61.	Eumenes sp.	12
		62.	Vespa tropica	15
		63.	Polistes olivaceus	32
Diptera	Culicidae	64.	Aedes sp.	32
		65.	Culex pipiens	21
	Mucidae	66.	Musca domestics	102
Isoptera	Rhinotermitidae	67.	Macrorhinotermes sp.	201
			Total	**3426**

III. Result:

A total 3426 insect samples have been collected during the month from May2019 to October 2019. Altogether 67 species of insects belonging to 31 families under 7 orders have been recorded (Table 1). According to the total number of species, dominant order is Coleoptera (33 species), followed by Lepidoptera (9 species), Hymenoptera (8 species), Hemiptera (7 species), Orthoptera (6 species), Diptera (3 species) and Isoptera (1 species). Among order Coleoptera, the family Scarabaebidae dominated with 9 species followed by Carabidae (6 species), Tenebrionidae (4 species), Curculionidae and Buprestidae (3 species each),Meloidae, Chrysomelidae, Elateridae (2 species each), Bostrichidae and Staphylionidae each shared 1 species.Among order Lepidoptera, the family Pieridae, Nymphalidae and Papilionidaedominated with 2 species each, Pyralidae, Erebidae and Sphingidae contain with 1 species each.The order Hymenoptera has a total number of 8 species belonging to family Apidae and Vespidae (3 species each) and Formicidae sharing 2 species.In order Hemiptera, it includes 6 families i.e Pentatomidae (2 species),Cicadidae, Coreidae, Derbidae and Membracidae and Lygaeidae which shared each only one species. Among order Orthoptera, family Acrididae includes 3 species followed byTettigonidae(2 species) and Grylidae (1 species). Among order Diptera contains family Culicidae (2 species)and family Mucidae with only 1 species. Isoptera order contains only 1 species.

IV. Dissection:

This study shows that the richness of the insect fauna comprising 3426 insect specimens belonging to 67 species. The result of this study reveals that the agriculture fields are dominated by insect diversity.The rich number of species available in the agroecosystem was mainly because of the availability of varieties of crop plants and microhabitats. Janzen (1973), Nair and Mathew (1993) andLosey et al. (2006) computed diversity of plants to insect diversity. The results shows that Hymenoptera were most dominant order (37.04%). Pioneer work on the Hymenoptera of Indian region was gave by Bingham (1897, 1903), Gaimary (2017) and Gandhi and Kumar (2015) which found reference to species found in Kerala. Subsequent to this, some studies have been made specifically on species found in different regions of Kerala. Coleopterans commonly known as beetles constitutes the largest order of all animals. The major ecological impact of beetle results from their effects on green plants, their contribution to breakdown of plant and animal debris and their predatory activities. India is well known for richness of coleopterans fauna and against an estimated total of 177 families of Coleopterans, about 103 families are known from India, of the 3,50,000 described species from all over the world, 15,000 species under 2,000 genera are known from India (Biswas, 1995). The present study revealed the presence of 33 species belonging to 10 families from the study area. According to total number of individuals it is second dominated order (25.18%). It has been analysed that order Coleoptera recorded highest Simpson's reciprocal index diversity (20.28), highest richness (4.733), Shannon-Wiener index(3.179) and evenness (0.909).

During the study order Orthoptera is third dominated order by 12.98% which belong to 3 families and 6 species.The order Orthoptera includes common insects like grasshoppers, locusts, crickets, mole crickets and

grouse locusts. Kirby (1914) andChopard (1969) wrote the Fauna on Acrididae and Grylloidea of India, and several species were included from Sikkim. Uvarov (1927) published the distributional record of family Acrididae of India. Most of the grasshoppers found in agriculture fields belongs to family Acrididae. These grasshoppers feed on plant foliage, with a particular fondness for grasses and spurges. When grass-hoppers population increase to the point of crowding, swarms of locusts can completely defoliate grassland and agricultural crops over large areas.In family Tettigoniidae 2 species has been recorded.Hemiptera insects that are usually called as 'true bugs' are of great economic importance as most of them are pests of various commercial crops. According to recent estimate about 80,000 Hemipteran species are present globally. In India 77 families having 6,500 species are found. Out of these, 2,421 species are endemic to India (Alfred, 2003). In the present study Hemiptera is third dominated order with 6.27% includes 6 species belonging to 5 families.Lepidoptera are commonly known as 'butterflies' and 'moths'. Two pairs of well-developed wings with colored scales on them. The various publications on Butterflies of India have been published by Marshall and De Niceville (1882),Betham (1890,1892), Evans (1932) and Talbot (1947). During the present study order Lepidoptera is fourth dominated order by 8.11% which belong to 6 families and 9 species.

The order Diptera comprises mosquitoes, midges and flies, which are generally two-winged, with two halteres, but there are some that have partially or entirely lost their wings, usually leaving their halteres intact behind. Through the works of Datta (1983)and Cherian (2002) in their faunal and monographical work included number of species from Sikkim. Till 1998, 624 species belonging to 230 genera and 45 families were known from Sikkim and subsequently 10 more species and a family Sciomyzidae are added to the Diptera fauna of Sikkim through the work of Datta and Parui (2003) which raised the number to 634 species under 46 families. In the present study Diptera is harboursabout 4.52% includes 3 species from 2 families viz.Culicidae and Mucidae.

V. Conclusion:

This studyauthenticates that agriculture fields are dominated by insect diversity. From these records it is clear that the agroecosystem, even though it is a man-made one, it had diverse entomofauna with good level of dispersal of the insects. It is aclear fact that insects contribute much to the ecological wellness and insect conservation has been admitted as vital for sustainable world in view of their critical role in conservation of ecosystem. From this study, the agroecosystem is still considered to have a diverse and numerous insect fauna in Mohacha village. However, the results which were being accorded in this article might be the first extensive list of insects in the Mohacha village of Sawai Madhopur district. Confidently, there will be a further research study on the insect biodiversity and abundance in this region, in order to obtain better and comprehensive facts on those characteristics to be recorded for future study.

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