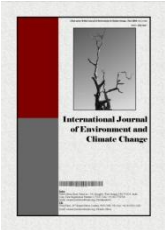

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Diversity of Insect Visitor's on Blossom of *Capparis decidua* (Forssk.) Edgew (Kair) in Northwest Rajasthan

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Capparis decidua flowers are cross-pollinated and favored by number of insect for collecting nectar and pollen rewards. It has for low fruit set ratio due to a high degree of self-incompatibility and it largely depends on cross pollination by insects for fruit setting. Present study focuses on studying diversity of insect visitors of *C. decidua* to enlist the dominant and most abundant insect pollinator of *C. decidua*. The data collected revealed that the most predominantly insects visiting the blossom belongs to insect order Hymenoptera, Coleoptera & Diptera. Among Hymenopteran insects different species of honey bees are the most abundant flower visiting insects.

Keywords: Capparis deciduas; insect visitors.

1. INTRODUCTION

Capparis decidua (Brassicales, Capparaceae) is commonly known as 'kair'. It is a key component of Thar ecosystem and has a noteworthy position in the diet of peoples of arid region of Rajasthan [1]. At the time of harsh summer season when the temperature raises up to 48^{o}C and the land becomes barren of herbaceous plants, shrubs of *C. decidua* are seen to grow gregariously providing shade to animals. The whole plant especially its fruit has medicinal value for cough,

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asthma, cardiac, rheumatism, asthma, diabetes, liver disorders, hypercholesterolemia, hypertension, microbial infections and many other problems [2-5]. "It is distributed throughout the arid regions of India and other countries. In general, the species has wide ecological amplitude and in India it is found abundantly on sandy, semi-rocky and rocky land forms in arid western Rajasthan, parts of Haryana state and in many other parts, especially arid and semi-arid tracts of the state of Gujarat, Punjab, Uttar Pradesh, Madhya Pradesh and Andhra Pradesh. Kair is a caducous plant, so in the foliage condition mainly stems and fruits are common" [4].

"Since the plant is xerophytic, it is generally found in desert area and is highly draught resistant plant which can survive for long. Kair is important in both forestry and horticulture. It is an ideal plant for stabilizing sand dunes and controlling soil erosion, especially wind erosion. The plant is used traditionally as anti-inflammatory, laxative, anti-diabetic, anthelmintic, antibacterial, astringent, digestive and diaphoretic and anodyne [6]. The female flowers of some of the *capparis* species are used as vegetable and fruits are used in pickle production because of their high nutritive ingredients like proteins, carbohydrate, minerals and vitamins" [7]. The immature fruits are rich in carbohydrates, proteins and mineral elements. Chouhan et al*.,* [8] reported that its of mature fruits are highly nutritious. The fruits were also found to be rich in dietary fiber [9]. "*C. decidua* is a small branched shrub, growing 4-5 m high. It bears pink flowers in small clusters along the leafless shoots, borne in the axils of the spines in corymbs. Red conspicuous flowers appear in March to April and August–September and ripe by May and October. It is extremely drought-resistant and tolerates some frost" [10]. This is a useful plant in its marginal habitat. *Capparis decidua* can be used in landscape gardening, afforestation and reforestation in semi-desert and desert areas; it provides assistance against soil erosion [11, and 12]. Unripe fruits of *Capparis decidua* serve as ingredient famous panchkuta and Tricutta vegetable of Rajasthan. Singh et al., [13] reported that there was low fruit set in both selfing and sibbing where individual flowers and inflorescences were bagged. Shekhawat [14] reported that in kair maximum pollination is cross pollination. Insects play a pivotal role in pollination of flowering plants [15-17]. Insects are also responsible for yield increase in self-pollinated and cross pollinated crops, and ensure global food supply and other services to mankind, Crenna et al. [18]. Pollinators as a vector do an imperative role in ecosystem by aiding in pollination thus facilitating in the process of reproduction in plants to maintain diversity. Thus, pollinators are concurrently essential to sustain ecosystems and human food security. The synergy among pollinators and their host plants plays a crucial role in the process of pollination; this synchrony may get impacted by Global climate change. As an outcome the composition of pollinator communities is expected to amend impacting the cross pollinated plant of the local regions. Rodger et al. [19] anticipated that nearly half of the flowering flora would experience a slump in fertility of over 80%, whereas a third would not bear seeds at all in the absence of pollinators. As pollinator diversity of a region helps to counter the risks associated with relying on a small number of species for pollination and making our agricultural and forestry systems more resilient in the long term therefore, in the current study, we aimed to investigate the pollinator community of *Capparis decidua*, an important medicinal shrub of Thar desert.

2. MATERIALS AND METHODS

"The field experiment was carried out on *C. decidua*, Jodhpur, Rajasthan. For assessing the diversity insect specimens were collected during the blossoming period of *C. decidua* in the month of March at different hours of day starting from early morning till evening (data were recorded 6 days after anthesis up to 90% flowering was over). The entire specimen collected were arranged systematically and identified". "Abundance of prevalent insect orders visiting *C. decidua* flowers was also recorded*.* For this purpose, the field experiment was laid in Randomized Blocks Design (RBD) and five plots of 30×30m were selected randomly. Thereafter, three branches on trees of each plot were marked and the numbers of insects visiting the flowers per plot within 5 minutes were recorded in forenoon (6-10hr), afternoon (10-14hr) and evening (14-18hr). The data was subjected to ANNOVA using SPSS® version 15.0 for Windows and evaluated at 5% significance".

3. RESULTS AND DISCUSSION

Flowering in *C. decidua* is asynchronous occurring in the March-June period when hardly any other flowers are available. A large number of insect visitors were observed for nectar and

pollen requirement. On *C.decidua* 44 species of insect pollinators belonging to five insect orders viz., 6 families: 16 genus of order Hymenopteran; 3 families: 7 genus of order Lepidopteran; 1 families: 1 genus of order Diptera; 2 family: 2 genus of order Coleopteran and 1 family: 1 genus of order of Hemiptera were recorded. Blitzer et al., [20] had quoted that pollinator diversity plays an important role in seed production in flowering plants. Plants visited by a functionally diverse pollinator community are shown to produce high quality and quantity of seeds [21,22]. Several researchers have suggested functionally diverse pollinators may improve gene flow and enhance genetic diversity [23,24].

Table 1. Insect visitors of *Capparis deciduas*

Scientific name	Common names	Order	Family
Danaus chrysippus Linnaeus	Plain Tiger/African Monarch	Lepidoptera	Nymphalidae
Colotis fausta Olivier	large salmon Arab	Lepidoptera	Pieridae
Colatis etrida Boisduval	Small orange tip	Lepidoptera	Pieridae
Colotis amata Fabricius	Small salmon Arab	Lepidoptera	Pieridae
Ixias mariane Cramer	White orange tip	Lepidoptera	Pieridae
Cepora nerissa Fabricius	The common gull	Lepidoptera	Pieridae
Belenois aurota Fabricius	Indian Pioneer	Lepidoptera	Pieridae
Eurema hecabe Linnaeus	Grass yellow or common grass yellow	Lepidoptera	Pieridae
Azanus ubaldus Stoll	Bright babul blue	Lepidoptera	Lycaenidae
Apis dorsata Fabricius	Giant honey bee	Hymenoptera	Apidae
Apis florea Fabricius	Small honey bee	Hymenoptera	Apidae
Polistes hebraeus Fabricius	Paper wasp	Hymenoptera	Vespidae
Vespa orientalis Fabricius	Oriental hornet	Hymenoptera	Vespidae
Megachile cephalotes Smith	Leaf cutting bee	Hymenoptera	Megachilidae
Megachile gathela Cameron	Leaf cutting bee	Hymenoptera	Megachilidae
Megachile studiosa Cresson	Leaf cutting bee	Hymenoptera	Megachilidae
Megachile vera Nurse	Leaf cutting bee	Hymenoptera	Megachilidae
Nomioides sp.	Halictid bee	Hymenoptera	Halictidae
Nomioides comberi Cameron	Halictid bee	Hymenoptera	Halictidae
Nomia elliotii Smith	Solitary bee	Hymenoptera	Halictidae
Camponotus compressus Fabricius	Black ants	Hymenoptera	Formicidae
Ceratina sexmaculata Smith	Small carpenter bee	Hymenoptera	Xylocopidae
Certaina binghami Cockerell	Small carpenter bee	Hymenoptera	Xylocopidae
Ceratina smaragdula Fabricius	Small carpenter bee	Hymenoptera	Xylocopidae
Ceratina propinqua Cameron	Small carpenter bee	Hymenoptera	Xylocopidae
Delta esuriens Fabricius	Wasp	Hymenoptera	Vespidae
Amegilla dizona Engel	Blue banded bee	Hymenoptera	Apidae
Amegilla confusa Smith	Blue banded bee	Hymenoptera	Apidae
Amegilla niveocincta Smith	Blue banded bee	Hymenoptera	Apidae
Amegilla zonata Fabricius	Blue banded bee	Hymenoptera	Apidae
Amegilla mucorea Klug	Blue banded bee	Hymenoptera	Apidae
Thyreus histrio Fabricius	Cuckoo bee	Hymenoptera	Apidae
Tetragonula iridiopennis Smith	Indian stingless bee	Hymenoptera	Apidae
Braunsapis mixta Smith	Solitary *bees*	Hymenoptera	Apidae
Icteranthidium sinapinum Cockerell	Solitary *bees*	Hymenoptera	Megachilidae
Halictus latisignatus Cameron	Sweat bees	Hymenoptera	Halictidae
Halictus lucidipennis Smith	Sweat bees	Hymenoptera	Halictidae
Xylocopa aestuans (Linnaeus	Carpenter bee	Hymenoptera	Xylocopidae
Xylocopa fenestrata Fabricius	Carpenter bee	Hymenoptera	Xylocopidae
Oxycetonia versicolour Fabricius	Flower chafer beetle	Coleoptera	Scarabaeidae
Mylabris pustula Thunberg	Blister beetles	Coleoptera	Meloidae
Bagrada cruciferarum Kirkaldy	Painted bug	Hemiptera	Pentatomidae
Musca sorbens Wiedemann	House fly	Diptera	Muscidae
Musca domestica Linnaeus	Bush fly	Diptera	Muscidae

3.1 Abundance of Insect Pollinators

During blooming period of *Capparis decidua* various insect visitors were recorded foraging on the flowers of tree. In present study insect visitor's assemblages were diverse with representatives from the orders Hymenoptera, Diptera, Lepidoptera, Hemiptera and Coleoptera visiting the bloom (Table 2, Fig 1). The most abundant insect visitor belongs to order Hymenoptera within which Apidae was the most abundant family of the bees which foraged for both nectar and pollen.

Abundance of hymenopteran insect visitors dominates in forenoon, afternoon and evening time. The minimum number of insect visiting the bloom was of order Hemiptera.

Similar findings were documented by Abdul et al., (2016) who reported bees as the most abundant floral visitors (1035 individuals) followed by wasp (354 individuals) and butterflies (151 individuals) in *Capparis aphylla.* In current study maximum numbers of insect visitor (3.99 average abundance /5 min) visiting the bloom were recorded in forenoon and least (1.31 average abundance /5 min) in the evening. There was a significant effect of different time of day with respect to visitation by insects on the bloom which may be due to high nectar concentrations in flower which attract more insect visitors in forenoon as compared with less nectar concentration in later day hours, similar to the findings of Silva and Dean [25].

Table 2. Abundance of pollinators order in *Capparis decidua*

Abundance of pollinators *in Capparis decidua* per plot (n=5)per 5 min				
Order	**Time Interval**			
T :Time intervals	**Forenoon**	**Afternoon**	**Evening**	**Mean**
T:Trees	A	A	A	
Lepidoptera	3.26	2	1.26	2.17
Diptera	3.33	2.39	1.65	2.46
Hymenoptera	5.89	3.38	1.51	3.59
Coleoptera	4.61	2.83	1.39	2.94
Hemiptera	2.89	2.11	0.72	1.91
Mean	3.99	2.54	1.31	2.61
SEM	0.34			
SEd	0.47			
CV	22.20			
CD@5%	1.09			
Significance @5%	SS (t)			

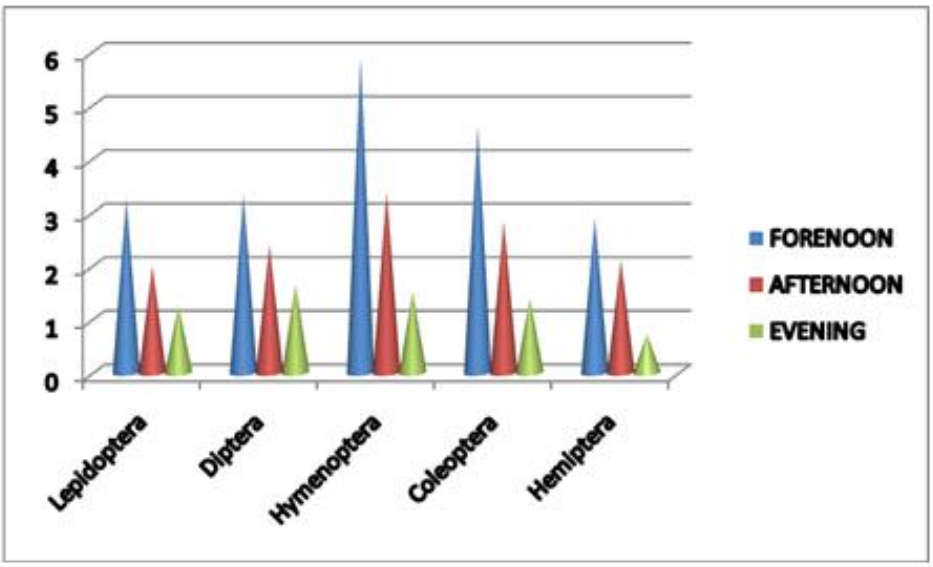

Fig. 1. Abundance of pollinators order in *Capparis decidua*

4. CONCLUSION

Hymenopterans were the most abundant floral visitors of *Capparis decidua* as compared to all other groups. In present study we listed the wild native insect visitors as they too contribute to overall pollination in natural as well as plantation ecosystems. Thus current study will be helpful in biodiversity conservation programs regarding sustainable forest management in the region as insect pollinators are not only considered important owing to their contribution in food chain nevertheless in the maintenance of biodiversity and ensures the survival of plant species by means of pollination.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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