

Diversity of insect visitor's on blossom of *Capparis decidua* (Forssk.) Edgew (Kair) in Northwest Rajasthan

Abstract

Capparis decidua flowers are cross-pollinated and favored by number of insect for collecting nectar and pollen rewards. It has a low fruit set ratio due to a high degree of self-incompatibility, and it relies heavily on insect pollination for fruit setting. The current research focuses on the diversity of insect visitors to *C. decidua* in order to identify the dominant and most abundant insect pollinator of *C. decidua*. According to the data collected, the majority of insects visiting the blossom belong to the insect orders Hymenoptera and Diptera. Honey bees are the most common flower visiting insects among Hymenopteran insects. Keywords: *Capparis decidua*, Insect visitors

Introduction

Capparis decidua (Brassicales, Capparaceae) is commonly known as 'kair'. *C. decidua* is a key component of Thar ecosystem and has a noteworthy position in the diet of peoples in arid region of Rajasthan (Meghwal and Tewari 2002). At the time of harsh summer season when the temperature raises up to 48 °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, asthma, cardiac, rheumatism, asthma, diabetes, liver disorders, hypercholesterolemia, hypertension, microbial infections and many other problems (mishra *et al.*, 2007; singh and mishra, 2010; Verma *et al.*, 2011; Dangi and Mishra, 2011). “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” (Verma *et al.*, 2011).

“Since the plant is xerophytic, it is generally found in dessert 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, diaphoretic and anodyne. 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” (Joseph, 2011). The immature fruits are rich in carbohydrates, proteins and mineral elements. Chouhan *et al.*, (1986) reported that “it’s of mature fruits are highly nutritious. The fruits were also found to be rich in dietary fiber” (Agarwal and Chouhan 1988). “*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” (Burdak, 1982). This is a useful plant in its marginal habitat. *Capparis decidua* can be used in landscape gardening, afforestation and reforestation in semidesert and desert areas; it provides assistance against soil erosion (Kaul, 1963 and Ghosh, 1977). Unripe fruits of *Capparis decidua* serve as ingredient famous panchkuta and Tricutta vegetable of Rajasthan. Singh *et al.*, (2005) reported that there was low fruit set in both selfing and sibbing where individual flowers and inflorescences were bagged. Shekhawat (1999) reported that in kair maximum pollination is cross pollination. Insects play a pivotal role in pollination of flowering plants (Kluser *et al.*, 2010, Mallinger and Prasifka, 2017, Vanbergen and Initiative, 2013). Insects are also responsible for yield increase in self-pollinated and cross pollinated crops, and ensure global food supply and other services to mankind, for review see Crenna *et al.* (2017). 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.* (2021) 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.

Material 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”. [21] “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”. [21]

Result 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.*, (2016) 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 (Gómez *et al.*, 2007; Celep *et al.*, 2020). Several researchers have suggested functionally diverse pollinators may improve gene flow and enhance genetic diversity (Cusser *et al.*, 2016; Kumar *et al.*, 2020).

Scientific name	Common names	Order	Family
<i>Danaus chrysippus</i> Linnaeus	Plain Tiger/African Monarch	Lepidoptera	Nymphalidae
<i>Colotis fausta</i> Olivier	large salmon Arab	Lepidoptera	Pieridae
<i>Colotis etrida</i> Boisduval	Small orange tip	Lepidoptera	Pieridae

<i>Colotis amata</i> Fabricius	Small salmon Arab	Lepidoptera	Pieridae
<i>Ixias mariane</i> Cramer	White orange tip	Lepidoptera	Pieridae
<i>Cepora nerissa</i> Fabricius	The common gull	Lepidoptera	Pieridae
<i>Belenois aurota</i> Fabricius	Indian Pioneer	Lepidoptera	Pieridae
<i>Eurema hecabe</i> Linnaeus	Grass yellow or common grass yellow	Lepidoptera	Pieridae
<i>Azanus ubaldus</i> Stoll	Bright babul blue	Lepidoptera	Lycaenidae
<i>Apis dorsata</i> Fabricius	Giant honey bee	Hymenoptera	Apidae
<i>Apis florea</i> Fabricius	Small honey bee	Hymenoptera	Apidae
<i>Polistes hebraeus</i> Fabricius	Paper wasp	Hymenoptera	Vespidae
<i>Vespa orientalis</i> Fabricius	Oriental hornet	Hymenoptera	Vespidae
<i>Megachile cephalotes</i> Smith	Leaf cutting bee	Hymenoptera	Megachilidae
<i>Megachile gathela</i> Cameron	Leaf cutting bee	Hymenoptera	Megachilidae
<i>Megachile studiosa</i> Cresson	Leaf cutting bee	Hymenoptera	Megachilidae
<i>Megachile vera</i> Nurse	Leaf cutting bee	Hymenoptera	Megachilidae
<i>Nomioides sp.</i>	Halictid bee	Hymenoptera	Halictidae
<i>Nomioides comberi</i> Cameron	Halictid bee	Hymenoptera	Halictidae
<i>Nomia elliotii</i> Smith	Solitary bee	Hymenoptera	Halictidae
<i>Camponotus compressus</i> Fabricius	Black ants	Hymenoptera	Formicidae
<i>Ceratina sexmaculata</i> Smith	Small carpenter bee	Hymenoptera	Xylocopidae
<i>Certaina binghami</i> Cockerell	Small carpenter bee	Hymenoptera	Xylocopidae
<i>Ceratina smaragdula</i> Fabricius	Small carpenter bee	Hymenoptera	Xylocopidae
<i>Ceratina propinqua</i> Cameron	Small carpenter bee	Hymenoptera	Xylocopidae
<i>Delta esuriens</i> Fabricius	Wasp	Hymenoptera	Vespidae
<i>Amegilla dizona</i> Engel	Blue banded bee	Hymenoptera	Apidae
<i>Amegilla confusa</i> Smith	Blue banded bee	Hymenoptera	Apidae
<i>Amegilla niveocincta</i> Smith	Blue banded bee	Hymenoptera	Apidae
<i>Amegilla zonata</i> Fabricius	Blue banded bee	Hymenoptera	Apidae

<i>Amegilla mucorea</i> Klug	Blue banded bee	Hymenoptera	Apidae
<i>Thyreus histrio</i> Fabricius	Cuckoo bee	Hymenoptera	Apidae
<i>Tetragonula iridiopennis</i> Smith	Indian stingless bee	Hymenoptera	Apidae
<i>Braunsapis mixta</i> Smith	Solitary bees	Hymenoptera	Apidae
<i>Icteranthidium sinapinum</i> Cockerell	Solitary bees	Hymenoptera	Megachilidae
<i>Halictus latisignatus</i> Cameron	Sweat bees	Hymenoptera	Halictidae
<i>Halictus lucidipennis</i> Smith	Sweat bees	Hymenoptera	Halictidae
<i>Xylocopa aestuans</i> (Linnaeus)	Carpenter bee	Hymenoptera	Xylocopidae
<i>Xylocopa fenestrata</i> Fabricius	Carpenter bee	Hymenoptera	Xylocopidae
<i>Oxycetonia versicolour</i> Fabricius	Flower chafer beetle	Coleoptera	Scarabaeidae
<i>Mylabris pustule</i> Thunberg	Blister beetles	Coleoptera	Meloidae
<i>Bagrada cruciferarum</i> Kirkaldy	Painted bug	Hemiptera	Pentatomidae
<i>Musca sorbens</i> Wiedemann	House fly	Diptera	Muscidae
<i>Musca domestica</i> Linnaeus	Bush fly	Diptera	Muscidae

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 visitors belong to order Hymenoptera within which Apidae was the most abundant family species of the bees which foraged for both nectar and pollen.

Abundance of hymenopteran insect visitors dominates in forenoon, afternoon and evening time. Abundance. 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 (2000).

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

	Abundance of pollinators in <i>Capparis decidua</i> 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)			

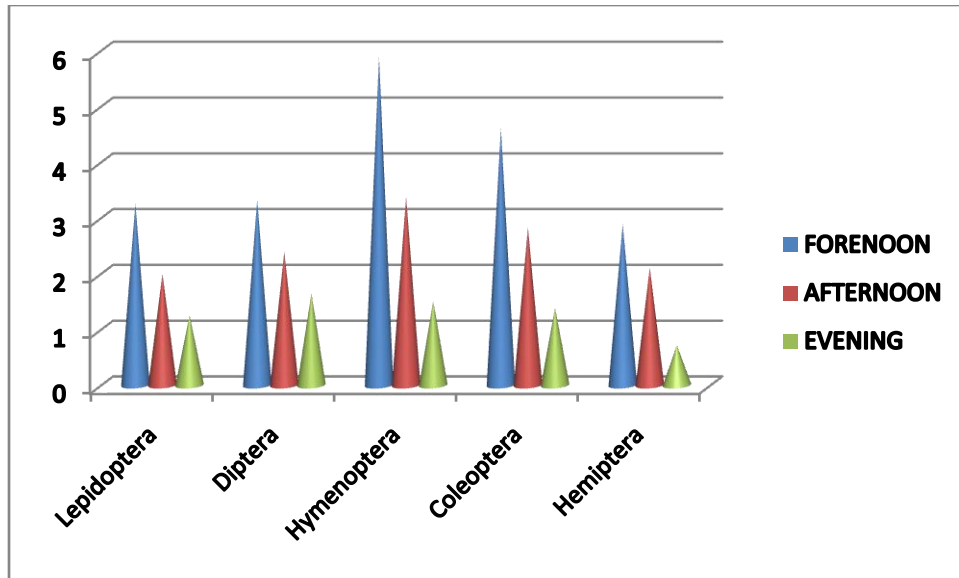


Fig1: Abundance of pollinators order in *Capparis decidua*

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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