

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

northwest of Rajasthan, India

Comment [RP1]: It is important to enter some degree of study location.

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* in Rajasthan. The data collected revealed that the most predominantly insects visiting the blossom belongs to insect order Hymenoptera. Among Hymenopteran insects different species of honey bees are the most abundant flower visiting insects.

Keywords: *Capparis decidua*, Insect visitors

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Introduction

Capparis decidua (Brassicales family, Ceapparidaceae) is commonly known as 'kair'. *C. apparis decidua* is a key component of Thar ecosystem and has a noteworthy position in the diet of peoples in arid region of Rajasthan (Reference). 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 and many other problems (Mishra *et al.*, 2007; Singh and Mishra, 2010; 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 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 (Meghwal and Tewari (2002). Kair is a caducous plant, so in the foliage condition mainly stem and fruits are common (Verma *et al.*, 2011).

Since the plant is xerophytic and highly draught resistant plant. Kair is important in both forestry and horticulture. It is reported to possess beneficial effects in various ailments, like rheumatism, asthma, diabetes, liver disorders, hypercholesterolemia, hypertension and microbial infections (Verma *et al.*, 2011) thus used traditionally as anti-inflammatory, laxative, anti-

diabetic, anthelmintic, antibacterial, astringent, digestive, diaphoretic and anodyne. The fruits of *C. decidua* are used in pickle production because of their high nutritive ingredients like proteins, carbohydrate, minerals and vitamins (Joseph, 2011). Chouhan *et al.*, (1986) reported that its mature fruits are highly nutritious. The fruits were also found to be rich in dietary fiber (Agarwal and Chouhan 1988). It rarely exceeds a height of 5 meters and remains mainly as a shrub, bearing red conspicuous flowers in March to April and August–September and produce ripen fruits by May and October. It is extremely drought-resistant and tolerates some frost (Burdak, 1982). *Capparis decidua* can be used in landscape gardening, afforestation and reforestation in semidesert and desert areas; it is an ideal plant for sand dunes stabilization and controlling 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) also reported maximum pollination in cross pollination. Insects that visits the blossom to pollen and nectar rewards play a pivotal role in pollination of flowering plants (Kluser *et al.*, 2010, Mallinger and Prasifka, 2017, Vanbergen and Initiative, 2013) and are also responsible for yield increase in both self-pollinated and cross pollinated crops thereby ensuring global food supply and ecosystem services (Crenna *et al.* (2017). 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.

[\(paragraph on pollinator diversity and their importance...\)](#)

-Pollinator diversity of a region helps to counter the risks associated with relying on a small number of species for pollination in context of climate change, 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 ([GPS](#)). 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 RBD design (Reference) and five plots of 30×30m were selected randomly. Thereafter, three branches on trees of each plot (N=X) were marked and the numbers of insects visiting the flowers of each plot within 5 minutes were recorded in forenoon (6-12 hours), afternoon (12-18 hours) and evening. (18-24 hours) The data was subjected to ANNOVA and evaluated at 5% significance.

Result and Discussion

Capparis decidua, a small branched shrub, growing 4-5 m high, bears pink red flowers in small clusters along the leafless shoots, borne in the axils of the spines in corymbs. Flowering in *C. decidua* is asynchronous occurring in three seasons; February to March (Ambe Bahar), July to August (Mrig Bahar) and October to November (Hast Bahar). As the blooming continues even in the hottest months in the March-June period when hardly any other flowers are available, thus offering foraging rewards to the insects visitors. A large number of insect visitors were observed visiting the blossom of *C. decidua* for nectar and pollen requirement. On *C. decidua* 44 species of insect visitors 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: 2 genus of order of Hemiptera were recorded (Table 1). In a similar study Abdul *et al.*, (2016) investigated pollinator community of *Capparis aphylla* at Punjab, Pakistan and revealed four bee, three wasp and two butterfly species visiting the flowers of *C. aphylla*.

Table:1 Insect visitors of *Capparis decidua*

Scientific name	Common names	Order	Family
<i>Danaus chrysippus</i>	Plain Tiger/African Monarch	Lepidoptera	Nymphalidae
<i>Colotis fausta</i>	large salmon Arab	Lepidoptera	Pieridae
<i>Colotis etrida</i>	Small orange tip	Lepidoptera	Pieridae
<i>Colotis amata</i>	Small salmon Arab	Lepidoptera	Pieridae
<i>Ixias mariane</i>	White orange tip	Lepidoptera	Pieridae
<i>Cepora nerissa</i>	The common gull	Lepidoptera	Pieridae
<i>Belenois aurota</i>	Indian Pioneer	Lepidoptera	Pieridae
<i>Eurema hecabe</i>	Grass yellow or common grass yellow	Lepidoptera	Pieridae
<i>Azonus ubaldus</i>	Bright babul blue	Lepidoptera	Lycaenidae
<i>Apis dorsata</i>	Giant honey bee	Hymenoptera	Apidae
<i>Apis florea</i>	Small honey bee	Hymenoptera	Apidae

Comment [RP3]: How many installments in total? I imagine that these same plots and branches were collected during the forenoon, afternoon and evening. Insert these details for better understanding.

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Comment [RP4]: What is the total effort in minutes per treatment?

Comment [RP5]: Specify the times that the collections were made in each category

Comment [RP6]: Analysis of Variance (ANOVA)? What software is used? Which version?

Comment [RP7]: This text must be removed or relocated. The results need to be presented for further discussion.

Comment [RP8]: And what do you have to add to the study by Abdul *et al.*, (2016) ? This sentence became disconnected, it needs to link with the result found.

Comment [RP9]: 1 - I suggest that the columns present another order: Order, Family, Scientific name and Common names.
2 - It would be interesting to insert the number of individuals recorded in forenoon, afternoon and evening for each species.

<i>Polistes hebraeus</i>	Paper wasp	Hymenoptera	Vespidae
<i>Vespa orientalis</i>	Oriental hornet	Hymenoptera	Vespidae
<i>Megachile cephalotes</i>	Leaf cutting bee	Hymenoptera	<i>Megachilidae</i>
<i>Megachile gathela</i>	Leaf cutting bee	Hymenoptera	<i>Megachilidae</i>
<i>Megachile studiosa</i>	Leaf cutting bee	Hymenoptera	<i>Megachilidae</i>
<i>Megachile vera</i>	Leaf cutting bee	Hymenoptera	<i>Megachilidae</i>
<i>Nomioides minutissimus</i>	Halictid bee	Hymenoptera	Halictidae
<i>Nomiodes curvilineatus</i>	Halictid bee	Hymenoptera	Halictidae
<i>Nomia elliotii</i>	Solitary bee	Hymenoptera	Halictidae
<i>Camponotus compressus</i>	Black ants	Hymenoptera	Formicidae
<i>Ceratina sexmaculata</i>	Small carpenter bee	Hymenoptera	Xylocopidae
<i>Certaina binghami</i>	Small carpenter bee	Hymenoptera	Xylocopidae
<i>Ceratina smaragdula</i>	Small carpenter bee	Hymenoptera	Xylocopidae
<i>Ceratina propinqua</i>	Small carpenter bee	Hymenoptera	Xylocopidae
<i>Delta esuriens</i>	Wasp	Hymenoptera	Vespidae
<i>Amegilla dizona</i>	Blue banded bee	Hymenoptera	Apidae
<i>Amegilla confusa</i>	Blue banded bee	Hymenoptera	Apidae
<i>Amegilla niveocinata</i>	Blue banded bee	Hymenoptera	Apidae
<i>Amegilla mucorea</i>	Blue banded bee	Hymenoptera	Apidae
<i>Thyreus histrio</i>	Cuckoo bee	Hymenoptera	Apidae
<i>Tetragonula iridiopennis</i>	Indian stingless bee	Hymenoptera	Apidae
<i>Braunsapis mixta</i>	Solitary bees	Hymenoptera	Apidae
<i>Icterantheidium sinapinum</i>	Solitary bees	Hymenoptera	<i>Megachilidae</i>
<i>Halictus latisignatus</i>	Sweat bees	Hymenoptera	Halictidae
<i>Halictus lucidipennis</i>	Sweat bees	Hymenoptera	Halictidae
<i>Xylocopa aestuans</i>	Carpenter bee	Hymenoptera	Xylocopidae
<i>Xylocopa fenestrata</i>	Carpenter bee	Hymenoptera	Xylocopidae
<i>Oxycetonia versicolour</i>	Flower chafer beetle	Coleoptera	Scarabaeidae
<i>Mylabris pustula</i>	Blister beetles	Coleoptera	Meloidae
<i>Stenozygum fieber</i>	Sting bug	Hemiptera	Pentatomidae
<i>Bagrada cruciferarum</i>	Painted bug	Hemiptera	Pentatomidae
<i>Musca sorbens</i>	House fly	Diptera	Muscidae
<i>Musca domestica</i>	Bush fly	Diptera	Muscidae

Abundance of insect pollinators: 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 (X species) within which Apidae was the most abundant family of the bees which foraged for both nectar and pollen (X species). Abundance of hymenopteran insect visitors

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dominates in forenoon, afternoon and evening time. The minimum number of insect visiting the bloom was found to be 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 visitors visiting the bloom were recorded in forenoon (X individuals) and least in the evening (X individuals) which may be due to high nectar concentrations in flower which attract more insect visitors 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*

Order	Abundance of pollinators in <i>Capparis decidua</i> per plot (N=X) per 5 min			
	TIME INTERVAL			Mean
T :Time intervals	FORENOON	AFTERNOON	EVENING	
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) ss (r)

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Comment [RP10]: Mean abundance?

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Comment [RP11]: I strongly suggest entering some measure of variation in the data (standard deviation, standard error or confidence interval).
Ex:
3.26±0.24

Comment [RP12]: Is this the result of ANOVA? It needs to be placed in the text.

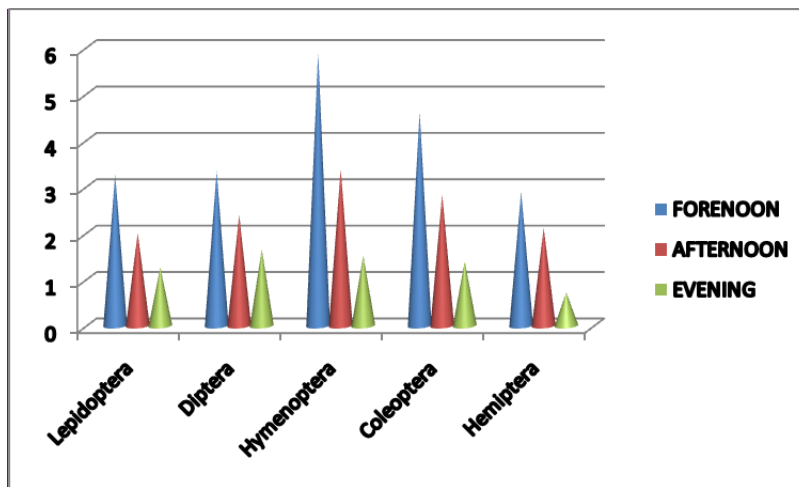


Fig1: Abundance of pollinators order in *Capparis decidua*

Comment [RP13]: 1 - Replace the cones with bars;
2 - Insert a variation measure;
3 - In addition to the main Orders, place their sum (Total) as a category on the X axis.

Comment [RP14]: Mean abundance?

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 ecosystems. Thus current study will be helpful in biodiversity conservation programs in the region as insect pollinators are not only considered important for their contribution in food chain but also in the maintaining biodiversity and securing the survival of plant species by means of cross pollination.

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