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

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

Introduction

Capparis decidua (family, capparidaceae) is commonly known as 'kair'. *Capparis decidua* is a key component of Thar ecosystem and has a noteworthy position in the diet of peoples in arid region of Rajasthan. 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, 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. 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. 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 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 of each plot within 5 minutes were recorded in forenoon, afternoon and evening. 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 occuring 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
Danaus chrysippus	Plain Tiger/African Monarch	Lepidoptera	Nymphalidae
Colotis fausta	large salmon Arab	Lepidoptera	Pieridae
Colatis etrida	Small orange tip	Lepidoptera	Pieridae
Colotis amata	Small salmon Arab	Lepidoptera	Pieridae
Ixias mariane	White orange tip	Lepidoptera	Pieridae
Cepora nerissa	The common gull	Lepidoptera	Pieridae
Belenois aurota	Indian Pioneer	Lepidoptera	Pieridae
Eurema hecabe	Grass yellow or common grass yellow	Lepidoptera	Pieridae
Azanus ubaldus	Bright babul blue	Lepidoptera	Lycaenidae
Apis dorsata	Giant honey bee	Hymenoptera	Apidae
Apis florea	Small honey bee	Hymenoptera	Apidae
Polistes hebraeus	Paper wasp	Hymenoptera	Vespidae
Vespa orientalis	Oriental hornet	Hymenoptera	Vespidae
Megachile cephalotes	Leaf cutting bee	Hymenoptera	*Megachilidae*
Megachile gathela	Leaf cutting bee	Hymenoptera	*Megachilidae*
Megachile studiosa	Leaf cutting bee	Hymenoptera	*Megachilidae*

Megachile vera	Leaf cutting bee	Hymenoptera	*Megachilidae*
Nomioides minutissimus	Halictid bee	Hymenoptera	Halictidae
Nomiodes curvilineatus	Halictid bee	Hymenoptera	Halictidae
Nomia elliotii	Solitary bee	Hymenoptera	Halictidae
Camponotus compressus	Black ants	Hymenoptera	Formicidae
Ceratina sexmaculata	Small carpenter bee	Hymenoptera	Xylocopidae
Certaina binghami	Small carpenter bee	Hymenoptera	Xylocopidae
Ceratina smaragdula	Small carpenter bee	Hymenoptera	Xylocopidae
Ceratina propinqua	Small carpenter bee	Hymenoptera	Xylocopidae
Delta esuriens	Wasp	Hymenoptera	Vespidae
Amegilla dizona	Blue banded bee	Hymenoptera	Apidae
Amegilla confusa	Blue banded bee	Hymenoptera	Apidae
Amegilla niveocinata	Blue banded bee	Hymenoptera	Apidae
Amegilla mucorea	Blue banded bee	Hymenoptera	Apidae
Thyreus histrio	Cuckoo bee	Hymenoptera	Apidae
Tetragonula iridiopennis	Indian stingless bee	Hymenoptera	Apidae
Braunsapis mixta	Solitary *bees*	Hymenoptera	Apidae
Icteranthidium sinapinum	Solitary *bees*	Hymenoptera	*Megachilidae*
Halictus latisignatus	Sweat bees	Hymenoptera	Halictidae
Halictus lucidipennis	Sweat bees	Hymenoptera	Halictidae
Xylocopa aestuans	Carpenter bee	Hymenoptera	Xylocopidae
Xylocopa fenestrata	Carpenter bee	Hymenoptera	Xylocopidae
Oxycetonia versicolour	Flower chafer beetle	Coleoptera	Scarabaeidae
Mylabris pustula	Blister beetles	Coleoptera	Meloidae
Stenozygum fieber	Sting bug	Hemiptera	Pentatomidae
Bagrada cruciferarum	Painted bug	Hemiptera	Pentatomidae
Musca sorbens	House fly	Diptera	Muscidae
Musca domestica	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 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 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 and least in the evening 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*

	Abundance of pollinators *in Capparis decidua* per plot 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) ss (r)			

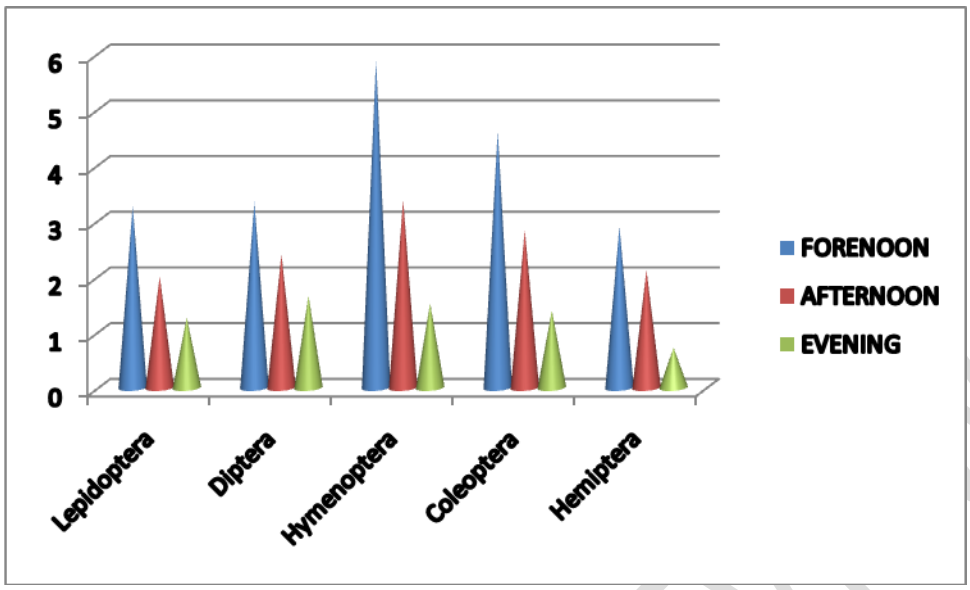

Fig1: **Abundance of pollinators order in *Capparis decidua***

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 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.

References

1. Abdul Latif, Saeed Ahmad Malik, Abid Mahmood Alvi, Qamar Saeed, Shafqat Saeed, Muhammad Atif Shuja, Muhammad Ejaz and Naeem Iqbal (2016). Pollinators' community of *Capparis aphylla* at Dera Ghazi Khan, Punjab, Pakistan. Journal of Entomology and Zoology Studies; 5(1): 967-969.
2. Agarwal V. and Chouhan B. M.(1988). A study on composition and hypolipidemic effect of dietary fibre from some plant foods. *Plant Food for Human Nutrition* 38(2): 1989-197.
3. Burdak, L.R. (1982). Recent Advances in Desert Afforestation- Dissertation submitted to Shri R.N. Kaul, Director, Forestry Research, F.R.I., Dehra Dun. p.55.
4. Chouhan B. M. Duhan A. and Bhatt C. M. (1986). Nutritional value of Ker *(Capparis decidua)* fruit. Journal of Food Science and Technology 23(2): 106-108Silva E., Dean

B.B. (2000). Effect of nectar composition and nectar concentration on honey bee (Hymenoptera: Apidae) visitations to hybrid onion flowers. J. Econ. Entomol ; 93:1216–1221.

5. Crenna E., Sala S., Polce C., Collina E. (2017). Pollinators in life cycle assessment: towards a framework for impact assessment. J. Cleaner Prod., 140: 525-536.
6. Kaul, R.N., 1963. Need for afforestation in the arid zones of India. La-Yaaran. Vol. 13.
7. Kluser, S., Neumann, P., Chauzat, M.-P., Pettis, J.S., Peduzzi, P., Witt, R., Fernandez, N., Theuri, M.(2010). Global honey bee colony disorders and other threats to insect pollinators (https://archive-ouverte.unige.ch/unige:32251).
8. Ghosh, R.C., 1977. Handbook on Afforestation Techniques. Dehra Dun, India.
9. Dangi K. S., Mishra S. N. (2011). Effect of *Capparis aphylla* stem extract treatment in normal and streptozotocin induced diabetic rats infected with *Candida albicans*. Asian Journal of Experimental Biological Sciences. 2011; 2: 102-107.
10. Mallinger R. and Prasifka J. (2017). Benefits of insect pollination to confection sunflowers differ across plant genotypes. Crop Sci., 57:3264-3272.
11. Meghwal P.R. and Tewari J.C. (2002). Kair (*Capparis decidua* (Forsk.) Edgew-A multipurpose woody species forarid regions. Forests. Trees and Livelihoods, 12:313-319.
12. Mishra S. N., Tomar P.C. and Lakra N (2007). Medicinal and food value of *Capparis* - a harsh terrain plant. Indian Journal of Traditional Knowledge; 6:230-238.
13. Shekhawat, J. S. (1999). Flower and fruit development in kair (*Capparis decidua* [Forsk.] Edgew). In: Recent Advances in Management of Arid Ecosystem. Proceedings of a Symposium held In India (eds.) A.S. Faroda, N.L. Joshi, S. Kathju and Amal Kar. Arid Zone Research Association of India, Jodhpur, pp. 383-386.
14. Singh K., Mishra S.N. (2010). Antimicrobial potency of stem extract of *Capparis aphylla*. Plant Archives, 10: 141-144.
15. Singh Manjit, Jindal S. K. and Sivadasan Rekha (2005). Capparis decidua - A Multipurpose Shrub. In book: Shrubs of Arid Zone, Edited by Editors Pratap Narain Manjit Singh M.S. Khan Suresh Kumar; published by Arid Agro-ecosystem Director National Agriculture Technology Project Central Arid Zone Research Institute Jodhpur.pp.97-104

16. Vanbergen A.J. and Initiative I. P. (2013).Threats to an ecosystem service: pressures on pollinators. Front. Ecol. Environ., 11: 251-259.
17. Verma P. D., Dangar R.D., Shah K. N., Gandhi D. M. and Suhagia B. N. (2011). Pharmacognostical Potential of *Capparis decidua* Edgew. Journal of Applied Pharmaceutical Science, 1 (10): 06-11.