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Floral visitors of basil (*Ocimum basilicum*) at Dera Ghazi Khan, Punjab, Pakistan

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Abstract

In the present study, pollinator community of basil (*Ocimum Basilicum* L.) was explored at Dera Ghazi Khan, Punjab, Pakistan. The results indicated that eight bee species, two wasp species, one fly and one butterfly species visited the flowers of *O. Basilicum*. Bees were found to be the most abundant floral visitors (1294 individuals) followed by wasp (208 individuals), fly (10 individuals) and butterflies (37 individuals). Among all pollinator species, *Apis florea* and *Apis dorsata* bees had the highest abundance (285 and 272 individuals, respectively). The highest visitation rate was recorded in *Nomia oxybeloides* (10.65±3.6 numbers of flowers/minute) followed by *A. florea* (6.2±3.8 numbers of flowers/minute) while *Zizeeria krasandra* butterfly had the lowest visitation rate (0.93±0.24 numbers of flowers/minute). The maximum visitation frequency (individuals/flower/minute) was recorded in *A. florea* (0.78±0.06) and the lowest in *Vespa orientalis* (0.18±0.01).

Keywords: Insect preferences, flower attraction, pollination, visitation frequency, visitation rate, pollen load

1. Introduction

Pollination is an important mechanism in flowering plants that is responsible for reproduction and maintenance the plant species on earth. Different pollination mechanisms have been reported in different plant species, genera and families. Some species are self-incompatible and require cross pollination while others are self-compatible. Even self-compatible plant species give higher yields if they are cross pollinated [1, 2].

Lamiaceae family of plants contains around 200 genera and 3000 species [3]. *Ocimum* is one of the most important genus of family Lamiaceae. This genus comprises 30-160 species which are mostly herbs and shrubs native to Asia, Africa, and Central and South America [4]. Basil (*O. basilicum*) is annual plant and commercially cultivated in many countries for various purposes [5]. Its different parts are used for the treatment of various human ailments including headaches, cough, diarrhea, constipation, warts, worms, and kidney malfunctions [6]. Oils extracted from its leaves and flowers are used in food, fragrances and dental and oral products [7, 8].

Pollination ecology of Lamiaceae family in general and *Ocimum* genus in particular is poorly understood. The present study was envisioned to study pollinator species of *O. basilicum* in Dera Ghazi Khan, Punjab, Pakistan.

2. Materials and Methods

The study site was located near the Indus colony, Dera Ghazi Khan (longitude 70° 29' 7" E and latitude 29° 57' 38" N). The experimental area contained undistributed natural habit and grassy field with large community of mesophytic plants like *Acacia arabica*, *Eucalyptus* sp., *Euphorbia splendens* etc.

2.1 Pollinators' survey

The total abundance (total numbers of individuals of a taxon in an area) of the pollinators was determined from the data recorded during the flowering season by following the methodology of Tidke and Thorat [9]. For visitation frequency of pollinators, 200 branches from 40 plants were selected and each branch was observed for five minutes and the numbers of each pollinator species visiting each branch were recorded. However, the visitation rate was measured by recording the time period spent by a visitor on a single flower.

Each visitor was observed for forty times during the flowering season. To avoid disturbance during data recorded, a specific distance was maintained and observer remained motionless. Observations were recorded during favourable environmental conditions.

2.2 Taxonomic Identification

Pollinators were captured with the help of hand net and killed in ethyl acetate fumes and preserved for identification. The preserved insect pollinators were identified to lowest taxonomic level by using standard identification keys developed by Department of Biology, Valdosta State University. The keys are available at http://entnemdept.ufl.edu/HallG/Melitto/floridabees/Bees_of_Florida_Part1.pdf

3. Results and Discussion

3.1 Pollinator Fauna

There were a total of eight bee species, two wasp species, one fly and one butterfly species captured from the flowers of *O. basilicum*.

3.2 Pollinator's Abundance

The data revealed the highest abundance of bees as compared to other taxonomic groups (Table 1). However among bees, *Apis florea* (285 numbers) was the most abundant species followed by *Apis dorsta* (272 numbers) while *Lasioglossum* sp.1 was the least abundant species. *Vespa dorylloides* (114 numbers) had maximum abundance compared to *Vespa orientalis* (94 numbers) wasp. The syrphid fly (*Ischiodon scutellaris*) and butterfly (*Zizeeria krasandra*) had abundances of 10 numbers and 37 numbers, respectively (Table 1).

3.3 Pollinator's Visitation Rate

Among all pollinator species, the maximum visitation rate (numbers of flowers visited per min) was observed in *Nomia oxybeloides* (10.65±3.6) followed by *A. florea* (6.2±3.8), *A. dorsata* (5.0±3.1). The lowest visitation rate was recorded in *Z. krasandra* (0.93±0.24). The visitation rates of other pollinator species is shown in Table 1.

3.4 Pollinator's Visitation Frequency

The visitation frequency of pollinator species is shown in Table 1. The highest visitation frequency (individuals per branch per minute) was recorded in syrphid fly, *Ischiodon scutellaris* (0.83±0.18) followed by honey species, *A. florea* (0.78±0.06) and *Lasioglossum* sp.1 (0.72±0.01) (Table 1). The lowest visitation frequency was found in *Vespa orientalis* (0.18±0.01).

The knowledge of the identity, abundance and diversity of different pollinator species could play an important role in devising a suitable plan for crop pollination [10, 11]. However, these factors vary significantly across time and landscape scales [12]. The results in the current study indicated that bees are the most abundant and frequent flower visitors of *O. basilicum* at in the climatic region of Dera Ghazi Khan. Bees have been reported as the most important pollinator group worldwide [13]. They are known to be found across a wide range of bio-geographical regions and habitat types having sufficient floral resources [13]. Our results are in accordance with Ali *et al.* [14] who reported bees as the most efficient and effective pollinators on canola crop in Pakistan. In another study [15] *A. florea* have been reported as the most abundant pollinator followed by *A. mellifera* on the bloom of *Allium cepa* under lowland conditions.

Table 1: Pollinator's in the orchid of *Ocimum basilicum* along with their total abundance, visitation rate and visitation frequency at Dera Ghazi Khan, Punjab, Pakistan

Order	Taxonomic group	Family	Genus/Species	Total abundance	Visitation rate (No. of flowers visited/min.) (N=40)	Visitation frequency (individuals/ branch/ minute) (N=200)	
Hymenoptera	Bees	Apidae	<i>Apis dorsata</i>	272	5.0±3.1	0.32±0.03	
			<i>Apis florea</i>	285	6.2±3.8	0.78±0.06	
			<i>Amegilla</i> sp.	209	3.96±0.21	0.40±0.06	
			<i>Ceratina sexmaculata</i>	125	4.73±2.9	0.69±0.64	
		Halictidae	<i>Nomia oxybeloides</i>	229	10.65±3.6	0.64±0.03	
			<i>Agapostemon</i> sp.	116	3.92±2.4	0.44±0.05	
			<i>Lasioglossum</i> sp.1	15	1.6±1.0	0.72±0.01	
			<i>Lasioglossum</i> sp.2	43	2.25±1.4	0.59±0.15	
			Vespidae	<i>Vespa dorylloides</i>	114	2.4±0.2	0.24±0.03
				<i>Vespa orientalis</i>	94	1.8±0.8	0.18±0.01
Diptera	Fly	Syrphidae	<i>Ischiodon scutellaris</i>	10	1.7±0.9	0.83±0.18	
Lepidoptera	Butterflies	Danaidae	<i>Zizeeria krasandra</i>	37	0.93±0.24	0.34±0.04	

4. Conclusion

From the present study, it is concluded that native bees are more efficient and frequent visitor of *O. basilicum* as compared to wasps, flies and butterflies at Dera Ghazi Khan.

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