



Studies on pollinator fauna and their relative abundance of sunflower (*Helianthus annuus* L.) at Pantnagar, Uttarakhand, India

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Abstract: Pollinators provide key services to both natural and agricultural ecosystems. Agricultural productivity depends, in part on pollinator populations from adjacent semi natural habitats. The diversity and abundance of different insect visitors on sunflower (*Helianthus annuus* L.) were studied at Pantnagar. A total of 12 insect visitors belonging to order Hymenoptera (9), Diptera (1), Lepidoptera (1), and Coleoptera (1) were observed visiting the blossom of sunflower. The abundance (percentage of insect/m²/2min.) of Hymenopterans were maximum (86.09 %) followed by the Dipterans (22.80 %) and others (3.87%). In Hymenopterans, the honeybees (*Apis* bees) were observed maximum (65.22 %) followed by non *Apis* bees (20.39 %) and the scold wasp (1.69 %).

Keywords: Abundance, Diversity, *Helianthus annuus*, Pollinator

INTRODUCTION

Several agriculture and horticulture crops cultivated in India derive benefit or are dependent on pollinating insects for effecting qualitative and quantitative improvement in crops yield. Among different pollinators, bees are considered as the best pollinating agents due to their suitable body size, hairiness, thoroughness, steadfastness, floral consistency and manageable populations. About one-third of the human diet comes from insect pollinated plants, and the honey bees account for 80 per cent of pollination (FAO, 1995). Sunflower is the second most important oil seed crop in the world next to soybean. It is important crop in the temperate countries like Russia, Bulgaria, Romania, Canada and the USA. India has the fourth largest area under sunflower (2.15 m ha) in the world. The flowers produce abundant quantity of nectar and pollen which attract large number of honey bees. In most of the crops we largely seek for honey bees and depend on them for pollination services. However, there are many other insects especially the native bees which may play significant role in pollination. Among pollinating insects, Hymenopterans species have proved as boon for efficient and effective pollination in most of the crops (De Grandi-Hoffman and Watkins, 2000). The experiments conducted at various research centers in India revealed that the crop yield and quality of produce can be increased considerably through bee's pollination (Torchio, 1994; Greenleaf and Kremen, 2006). Bees certainly are essential in seed production of sunflower because pollen must be transferred from male-

fertile to male sterile plants (De Grandi-Hoffman and Chambers, 2006). Keeping above in view the present investigation was conducted to study the pollinator fauna and their relative abundance of sunflower (*Helianthus annuus* L.) at Pantnagar, Uttarakhand.

MATERIALS AND METHODS

The studies were conducted at Apiary site in College of Agriculture, G. B. Pant University of Agriculture and Technology Pantnagar, Uttarakhand (India) during the year 2012. The diversity of insect visitors was recorded and the individuals collected by a hand net. Sweeps were made at peak blooming period of sun flower crop every day, at fixed time intervals. The abundance of insect visitors per sq. m. area was recorded at hourly intervals from 10:00 to 14:00 h, during the blooming period of the crop. The averages of the observations were calculated.

RESULTS AND DISCUSSION

Diversity of pollinators: A total of 12 insect visitors belonging to order Hymenoptera (9), Diptera (1), Lepidoptera (1), and Coleoptera (1) were found to visit the sunflower crop (Table 1).

Hymenopteran visitors belonged to six families namely Apidae (4), Xylocopidae (1), Halictidae (2), and Magachilidae (1). Lepidopteran visitors belonged to families Pieridae (1). Besides this some Dipteran visitor belonged to families Syrphidae (1) were observed on sunflower. From the family Apidae, honeybees (*Apis mellifera*, *A. dorsata* and *A. cerana indica*), and stingless bee (*Trigona laeviceps*) were the five species that were

Table 1. Diversity of pollinator on sunflower crop at Pantnagar.

Insect visitor	Common name	Order	Family
<i>Apis mellifera</i>	Italian honey bee	Hymenoptera	Apidae
<i>A. dorsata</i>	Rock bee	Hymenoptera	Apidae
<i>A. cerana indica</i>	Indian honeybee	Hymenoptera	Apidae
<i>Trigona laeviceps</i>	Stingless bee	Hymenoptera	Apidae
<i>Megachile disjuncta</i>	Leaf cutter bee	Hymenoptera	Megachilidae
<i>Xylocopa iridipennis</i>	Carpenter bee	Hymenoptera	Xylocopidae
<i>Anthophora</i> sp.	Digger bee	Hymenoptera	Anthophoridae
<i>Halictus</i> spp.	Sweat bee	Hymenoptera	Halictidae
<i>Nomia</i> sp.	Alkali bee	Hymenoptera	Halictidae
<i>Syrphus corollae</i>	Syrphid fly	Diptera	Syrphidae
<i>Pieris brassicae</i>	Cabbage butterfly	Lepidoptera	Pieridae
<i>Coccinella septumpunctata</i>	Ladybird beetle	Coleoptera	Coccinellidae

Table 2. Relative abundance of different insect visitors on sunflowers of during different hours of the day.

Insect groups	Abundance of insect visitor (insect visitors/m ² /2min)			
	10:00 h	12:00 h	14:00 h	Mean
Hymenopterans	85.30	88.50	84.48	86.09
<i>Apis</i> bees	70.80	66.31	58.55	65.22
Non <i>Apis</i> bees	15.74	21.28	24.17	20.39
Wasp	0.89	2.43	1.76	1.69
Dipterans	20.10	25.66	22.64	22.80

Table 3. Number of species of floral visitors on sunflower crop.

Insect visitors	Percent abundance of pollinators (insect visitors/m ² /2min)			
	10:00 h	12:00 h	14:00 h	Mean
<i>Apis mellifera</i>	80.25	88.26	83.42	83.97
<i>Apis dorsata</i>	33.73	40.50	41.30	38.51
<i>Apis cerana</i>	45.13	53.30	33.11	43.84
<i>Apis florea</i>	4.00	4.15	6.60	4.91
<i>Halictus</i> spp.	9.67	10.06	13.00	10.91
<i>Trigona laeviceps</i>	31.65	44.61	45.23	40.49
<i>Anthophora</i> sp.	22.87	33.89	25.39	27.38
<i>Nomia</i> sp.	10.83	18.94	16.20	15.33
<i>Xylocopa iridipennis</i>	5.17	18.78	12.35	12.10
<i>Megachile disjuncta</i>	10.43	14.91	18.72	14.68
<i>Syrphus</i> spp.	21.30	33.13	33.73	29.38
Others	2.60	2.89	6.13	3.87

recorded on the sun flowers. carpenter bee (*Xylocopa iridipennis*) of Xylocopidae, the Alkali Bees (*Nomia* sp.) and *Halictus* sp. of Halictidae, Leaf cutter bee (*Megachile disjuncta*) of Megachilidae, the digger bee (*Anthophora* sp.) of Anthophoridae and *Sphex* sp. of Sphecidae visited the sunflower. From Diptera family Syrphidae (*Syrphus corollae*). Lepidopterans namely Cabbage butterfly (*Pieris brassicae*) of family Pieridae was observed. Jadhav *et al.* (2011) observed that twenty species visiting sunflower heads that belonged to orders Hymenoptera,

Lepidoptera, Diptera and Coleoptera. Species richness was high in Hymenoptera followed by Lepidoptera and Coleoptera. Hymenoptera comprised of two families, Lepidoptera of four families, Coleoptera of three families and one family under Diptera. *A. mellifera* L. was the most important pollinator of sunflower in France while the other pollinator fauna included five species of *Bombus*, *Halictus* and *Andrena* (Delaude *et al.*, 1978).

Relative abundance of different pollinators: The abundance (percentage of insect/m²/2min.) of

Hymenopterans were maximum (86.09 %) followed by the Dipterans (22.80 %) and others (3.87%). In Hymenopterans, the honeybees (*Apis* bees) were observed maximum (65.22 %) followed by non *Apis* bees (20.39 %) and the scold wasp (1.69 %). The Italian honey bee (*Apis mellifera*) was maximum (83.97 %) followed by *A. cerana indica* (43.84 %), *A. dorsata* (38.51 %), *A. florea* (4.49 %), the stingless bee (40.49 %), *Halictus* spp. (10.91 %), *Anthophora* sp. (27.38 %), *X. iridipennis* (12.10%), and *Syrphus* spp. (29.38 %) of the insect visitors on sunflower was recorded. Maximum abundance of *A. mellifera* was observed at 1200h with mean of 88.26 and least (80.25) at 1000h. According to Swaminathan and Bhardwaj (1982), *A. dorsata* formed the chief pollinator and constitute about 81.20% of the total insect visitors followed by *A. florea* (8.23%), *Lasioglossum* sp (3.75%), *Pithitis Smaragdula* (2.37%), *Xylocopa* sp. (0.14%), and *Chalicodoma lerma* (0.13%) (Tables 2 and 3). Ahmed et al. (1989) found that among the insects visiting sunflower, Hymenopterous species were the most important pollinators and honeybees formed 75 per cent of Hymenoptera on sunflower. Other bees which visited the crop and directly affected yield were *Bombus* spp., *Nomia melanderi*, *Megachile rotundata* and *Halictus* sp (Moreti et al., 1996).

Conclusion

In conclusion, this study provides insights into the importance of pollinator insects to help plant pollination, included sun flower an importance crop in the tropic. It is clear from present finding that the sunflower capitulum in bloom is highly attractive to multitude of insect species, especially those belonging to Hymenoptera and Diptera. The results indicate a diversity and abundance of pollinator insects, especially bees, plays a significant role in seed set of sunflower. Hence, conservation of bee species by encouraging increased forage crops in the

vicinity of cropped areas is recommended which enriches biodiversity along the line.

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