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Abundance of flower visitors and their foraging behaviour in Niger

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Abstract

The experiment was undertaken at college farm of Navsari Agricultural University, Navsari during *Kharif*, 2016. Insect flower visitors/pollinators were recorded at time periods starting from 06.00 to 18.00 h. The niger flowers were found to be visited by three species of honey bees viz., *Apis dorsata* F., *A. florea* F., *A. cerana* F. as well as sting less bees, dipteran flies, lepidopterans and hemipteran bugs. Among different bee species, *A. dorsata* was the predominant flower visitors (9.33 bees/m²/5minute) constituting 60.74 per cent of total flower visitors which was followed by *A. florea* (2.30 bees/m²/5 minute) and *A. cerana* (1.17 bees/m²/5 minute) constituting 14.97 and 7.62 per cent of total flower visitors, respectively. The mean activity of flower visitors was more at 11 00 h (54.29 visitors/m²/5 minute) followed by at 10 00 h (42.24 visitors/m²/5 minute). Considering the activity of different visitors at different days of observation (irrespective of the hour of the day) indicated that the maximum activity was observed in third week of flowering (26.56 visitors/m²/5 minute) followed by fourth week of flowering (19.87 visitors/m²/5 minute). Due to self-incompatible nature of niger flower, insect pollinators are the more importance in increasing productivity of niger.

Keywords: Pollinators, flower visitors, honey bees, niger, foraging behaviour

Introduction

Among the edible oilseed crops, the Niger, *Guizotia abyssinica* (L.f) Cass. is an important oilseed crop cultivated in Ethiopia and India for millennia. The genus *Guizotia* belongs to family compositae (Asteraceae), tribe heliantheae and sub tribe coreopsinidae. It is commonly known as ramtal or kharsani (Gujarati); ramtil, jagni or jatangi (Hindi); karale or khurasani (Marathi); uhechellu (Kannada); payellu (Tamil); verrinuvvulu (Telugu); alashi (Oriya); sarguza (Bengali); ramtil (Punjabi) and sorguja (Assamese) in different parts of the country ^[1]. Niger is a completely out crossing species with a self-incompatibility mechanism ^[2, 3, 4, 5]. The cross fertilization was proven as early as in 1911 at Pusa by examination of 29 cultures raised from the seed of a single plant ^[2].

The insect, particularly bees were major agents of pollination in niger. Pollinators are the most important insects playing vital role in the process of niger pollination. The crop provides both pollen and nectar to honey bees and large quantities of nectar are collected from this crop wherever extensive cultivation is undertaken. Honey bees, due to higher numbers, vigorous daily activity, as well as their body structure conduct pollen transportation from one flower to another. Utilization of bees in pollination not only increased the yield of various crops but also improves their quality. It helps for uniform maturity and early harvest of the crop. Looking to the importance of pollination in niger, the experiment was planned to study the “abundance of flower visitors and their foraging behaviour in niger”.

Materials and Methods

The field experiment was laid out in randomized block design (RBD) with three replications conducted during *Kharif*, 2016 at college farm of Navsari Agricultural University, Navsari (Gujarat), India. Seeds of niger variety GN-1 as a release variety of NRS, Vanarasi, NAU (Gujarat), India were sown on 30th of July with a spacing of 30 cm × 10 cm in net plot size of 3.9 m × 2.6 m. The cultural operations were done as and when required.

The observations on number of different insect visitors at different hours of the day starting from 06 00 to 18 00 h were recorded at weekly interval with initiation of flowering. The abundance of different visitors was recorded by counting number of different visitors visited flowers of 1 m × 1 m area per five minutes at different hours of day.

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Relative abundance of each species was determined by using the following formula:

$$\text{Relative abundance of species} = \frac{\text{Mean Number of individuals visiting flower}}{\text{Mean number of pollinators counted}} \times 100$$

Results and Discussion

During the present investigation on abundance of flower visitors and foraging behaviour of honey bees in niger, the observations were recorded on the types of flower visitors and foraging behaviour of honey bees in niger.

The data recorded on the activity of different visitors at different hours of the day in 1 m² area for the period of five minutes presented in Table 1 and Figure 1 indicated that among different bee species, *A. dorsata* was the predominant flower visitors (9.33 bees/m²/5minute) constituting 60.74 per cent of total flower visitors which was followed by *A. florea* (2.30 bees/m²/5 minute) and *A. cerana* (1.17 bees/m²/5 minute) constituting 14.97 and 7.62 per cent of total flower visitors, respectively. Among different bee species, *A. dorsata* was the found predominant during present study which was previously reported by Guruprasad (2001) [6], Pastagia (2006) [7] and Dhurve (2008) [8] which supports the present findings. However, Rao and Suryanarayana (1990) [9], Panda *et al.* (1995) [10], Bhat *et al.* (2002) [11], Chaudhary and Kumar (2002) [12], Roopa and Gowda (2002) [13] and Muddi (2012) [14] reported predominance of *A. florea* while Rajurs (2001) [15] and Painkra *et al.* (2015) [16] reported predominance of *A. c. indica* on niger flowers in different regions. The variation in the activity different species of honeybees on niger in different regions may be attributed to bee population present in the regions.

Apart from honey bees, the activity of sting less bees, lepidopterans, dipterans and hemipterans was reported to be 0.77, 0.76, 0.55 and 0.47 visitors/m²/5 minute constituting 5.01, 4.95, 3.58 and 3.06 per cent of the total visitors, respectively (Table 1).

Further, the perusal of data presented in Table 1 revealed that, the mean activity of flower visitors was more at 11 00 h (54.29 visitors/m²/5 minute) followed by at 10 00 h (42.24 visitors/m²/5 minute), 12 00 h (33.81 visitors/m²/5 minute),

09 00 h (23.81 visitors/m²/5 minute), 16 00 h (16.76 visitors/m²/5 minute), 17 00 h (11.90 visitors/m²/5 minute), 15 00 h (7.43 visitors/m²/5 minute) and 08 00 h (6.86 visitors/m²/5 minute). The lower activity of flower visitors was observed at 18 00 h (1.29 visitors/m²/5 minute), 07 00 h (1.19 visitors/m²/5 minute) and 13 00 h (0.05 visitors/m²/5 minute). No activity of flower visitors was observed at 06 00 h and 14 00 h. Previously, Panda *et al.* (1995) [10] reported peak activity of flower visitors was during 11 00 and 12 00 h; Rajurs (2001) [15] noted it at 10 00 h; Bhat *et al.* (2002) [11] reported maximum visits by various visitors during 10 00 to 12 00 h; Pastagia (2006) [7] reported peak activity of flower visitors was during 11 00 h in kharif 2004 and 10 00 h in Rabi 2004-05 and Painkra *et al.* (2015) [16] which supports the present findings.

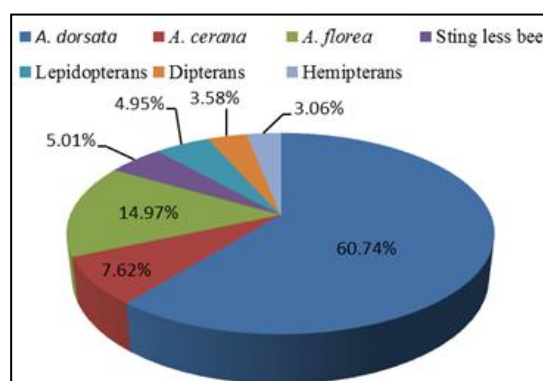


Fig 1: Relative abundance of the flower visitors on niger flowers

Considering the activity of different visitors at different days of observation (irrespective of the hour of the day) presented in Table 02 indicated that the maximum activity was observed on 09.10.2016 i.e., in third week of flowering (26.56 visitors/m²/5 minute) followed by 16.10.2016 i.e., on fourth week of flowering (19.87 visitors/m²/5 minute) and on 23.10.2016 i.e., fifth week of flowering (15.72 visitors/m²/5 minute). Previously, Pastagia (2006) [7] reported maximum activity on third week of flowering followed by on second week of flowering in kharif and rabi season.



Plate 1: General view of experimental plot



Plate 2: Apis spp. visiting in niger flowers

Table 1: Activity of different flower visitors of niger at different hours of the day

Time (Hours)	*Mean number of flower visitors/m ² /5 min							
	<i>A. dorsata</i>	<i>A. cerana</i>	<i>A. florea</i>	Sting less bee	Lepidopterans	Dipterans	Hemipterans	Total
06 00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
07 00	0.00	0.00	0.00	0.00	0.19	0.24	0.76	1.19
08 00	3.05	0.05	0.14	0.00	1.48	1.14	1.00	6.86
09 00	13.43	1.48	3.57	0.76	1.76	1.71	1.10	23.81
10 00	25.29	3.76	8.48	1.76	1.67	0.90	0.38	42.24
11 00	39.00	5.57	5.38	2.38	1.19	0.57	0.19	54.29
12 00	23.05	2.24	4.29	3.19	0.52	0.00	0.52	33.81
13 00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.05
14 00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15 00	6.10	0.00	0.48	0.00	0.52	0.05	0.29	7.43
16 00	7.71	1.33	4.19	1.00	1.00	1.33	0.19	16.76
17 00	3.52	0.81	3.43	0.95	1.29	0.76	1.14	11.90
18 00	0.10	0.00	0.00	0.00	0.24	0.38	0.57	1.29
Mean	9.33	1.17	2.30	0.77	0.76	0.55	0.47	15.36
Percent	60.74	7.62	14.97	5.01	4.95	3.58	3.06	---

*Mean of seven observations taken during flowering period of niger

Table 2: Activity of flower visitors of niger crop at different periods during crop sown at 30th July

Date	Mean number of flower visitors/m ² /5 min							
	<i>A. dorsata</i>	<i>A. cerana</i>	<i>A. florea</i>	Sting less bee	Lepidopterans	Dipterans	Hemipterans	Total
25-09-2016	4.79	1.10	1.64	0.26	0.62	0.64	0.00	9.05
02-10-2016	7.95	1.33	2.26	1.26	0.72	0.64	0.59	14.74
09-10-2016	17.08	2.18	3.18	1.74	1.18	0.62	0.59	26.56
16-10-2016	12.92	1.69	2.51	0.77	0.92	0.44	0.62	19.87
23-10-2016	9.85	0.59	2.26	0.92	0.85	0.62	0.64	15.72
30-10-2016	7.46	0.62	1.51	0.00	0.62	0.44	0.41	11.05
06-11-2016	5.23	0.69	2.77	0.46	0.44	0.44	0.46	10.49
Mean	9.33	1.17	2.30	0.77	0.76	0.55	0.47	15.36

Conclusion

From the preliminary investigation on 'Abundance of flower visitors and their foraging behaviour in niger' it is concluded that due to self-incompatible nature of niger flower, insect pollinators are the more importance in increasing productivity of niger. Niger attracts rich fauna of insects as pollinators in which the honey bees were the major group. Hence, conservation of bee species is recommended which enriches biodiversity along the line.

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