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Enumeration of Insect Visitors and Relative Abundance of Insect Pollinators on Onion (*Allium cepa* L.) Flower

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ABSTRACT
The insect visitors of onion flower were investigated to study the pollinator biodiversity of onion flowers is in Nadia district of West Bengalduring 2015-16. The insect visitors of onion flowers were enumerated and their relative abundance was worked out. 28 species of insects belonging to 24 genera in 21 families under 7 orders visited onion flowers, of which Apisdorsata(7.14 insects/sq.m) was the most abundant pollinator followed by A. mellifera(4.42 insects/ sq.m.)
Keywords: onion, pollination, biodiversity, honey bee.

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INTRODUCTION

Onion (*Allium cepa* L.) is an extremely important vegetable crop. A global review of major vegetables shows that onion ranks second after tomato in area. Approximately, 36 million tons of onions are produced on 2-5 million ha globally. India is the 2nd largest producer of onion in the world next only to China, with 19.90% share in world total production, but the productivity of onion in India is very low, i.e., 16.29 tones/ha as compared to China and other countries like Egypt, Netherlands, and Iran etc. In India 187.36 lakh MT onion is produced over 11.50 lakh ha area (Anon., 2015). The major onion producing states of India are Maharashtra, Gujarat, Orissa, Karnataka, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Bihar, Punjab and Rajasthan, with Maharashtra as the leading onion producing state contributing 33%, followed by Karnataka 17% and Gujarat with 10% of onion production of India.

Plant species of economic importance are either self-fertile and set fruit or seed with their own pollen (self-pollination), or self-infertile and need to receive pollen from other plants of same species (cross pollination). More commonly, the process of pollination requires an external agent or pollinators, both biotic and abiotic as a vector to transfer the pollen to the female reproductive parts of flower, thereby enabling fertilization and sexual reproduction. In only 15% of plant species pollination occurs due to abiotic agents whereas remaining 85% species are pollinated by biotic agents (animal pollination or *zoophily*).

There are roughly two lakh species of biotic pollinators in the world, most of which are insects and are thought to contribute between 15% and 30% of global food production (Roubik, 1995).Insect pollinators play an important functional role in most terrestrial ecosystems and provide a key ecosystem service. Insect pollination may give advantages other than increasing the yield of a crop. An abundance of pollinators sets a greater proportion of early flowers resulting in an earlier and more uniform crop. Insect pollination increases not only quantity but also the quality of fruit.

According to Banik, (1990), the pollination activity of wind has little effect (10%) on onion pollination because of its sticky pollen, other pollinators were 3% and honey bees were 87% in onion pollination.

Keeping this view in mind, the present investigation has been aimed at identifying and finding out the different insects visitors, including honeybees (*A. mellifera* Linn.) in onion.

METHODOLOGY

The insect species visiting the flowers of onion were inspected from 9am-1pm. The insect species were collected and were subsequently identified following the literature available.
The activity of the insect visitors on onion flower was observed closely. On the basis of observed activities of insects, adherence of pollen grains on underside of their body and available literature these were grouped as pollinators, possible pollinators, uncertain pollinators and accidental visitors.
The number of all these insects present/sq.m of onion field were also recorded at around 11am from which the relative abundance of these species were calculated using the formula,

$$\textbf{Relative abundance (\%)} = \frac{\text{Population of a particular species visiting the onion crop}}{\text{Total population of all species of pollinators visiting onion crop}} \times 100$$

RESULT AND DISCUSSION

The crop was visited regularly after blooming of flowers to record the insects visiting onion flowers. The insects were collected, preserved and were later identified following available literature.
The insect species recorded on flower heads (umbels) of onion during the blooming period, their systematic position and possible role as pollinator are presented in Table-1

TABLE-1: List of Insects Visiting Onion Flower During 2015-16

S.NO.	COMMON NAME	SCIENTIFIC NAME	FAMILY	ORDER	STATUS AS POLLINATOR
1.	European/ Italian bee	*Apismellifera*	Apidae	Hymenoptera	Pollinator
2.	Rock bee	*Apisdorsata*	Apidae	Hymenoptera	Pollinator
3.	Indian bee	*Apiscerana*	Apidae	Hymenoptera	Pollinator
4.	Little bee	*Apisflorea*	Apidae	Hymenoptera	Pollinator
5.	Leaf cutter bee	*Megachile sp.*	Xylocopidae	Hymenoptera	Pollinator
6.	Carpenter bee	*Xylocopsviolacea*	Xylocopidae	Hymenoptera	Pollinator
7.	Wasps	*Vespa cincta*	Vespidae	Hymenoptera	Possible
8.	Ant	*Formica sp.*	Formicidae	Hymenoptera	Possible
9.	Hover fly	*Episyrphusbalteatus*	Syrphidae	Diptera	Pollinator
10.	Hoverfly	*Sphaerophoriascripta*	Syrphidae	Diptera	Pollinator
11.	House fly	*Musca domestica*	Muscidae	Diptera	Pollinator
12.	Blow fly	*Chrysomyabezziana*	Calliphoridae	Diptera	Pollinator
13.	Flesh fly	*Sarcophaga sp.*	Sarcophagidae	Diptera	Pollinator
14.	Mustard sawfly	*Athalialugensproxima*	Tenthridinidae	Diptera	Accidental visitor
15.	Monarch butterfly	*Danauschrysippus*	Danaidae	Lepidoptera	Possible
16.	Tiger butterfly	*Danausgenutia*	Danaidae	Lepidoptera	Possible
17.	Unidentified pierid	*Pieris sp.*	Pieridae	Lepidoptera	Possible
18.	Amata moth	*Amata passalis*	Amatidae	Lepidoptera	Possible
19.	American bollworm	*Helicoverpaarmigera*	Noctuidae	Lepidoptera	Uncertain
20.	Tobacco caterpillar	*Spodopteralitura*	Noctuidae	Lepidoptera	Uncertain
21.	Diamond back moth	*Plutellaxylostella*	Plutellidae	Lepidoptera	Accidental visitor
22.	Blister beetle	*Mylabrispustulata*	Meloidae	Coleoptera	Possible
23.	Lady bird beetle	*Cheilomenes sp.*	Coccinellidae	Coleoptera	Possible
24.	Mausoleopsis beetle	*Mausoleopsisamabilis*	Scarabaeidae	Coleoptera	Accidental visitor
25.	Gundhi bug	*Leptochorisaoratoria*	Alydidae	Hemiptera	Accidental visitor
26.	Onion thrips	*Thripstabaci*	Thripidae	Thysanoptera	Uncertain
27.	Dragonfly	*Sympetrum flaveolum*	Libellulidae	Odonata	Uncertain
28.	Damsel fly	*Enallagmacyathigerum*	Coenagrionidae	Odonata	Uncertain

During the present investigation, 28 spp. of insects were found to visit onion flowers, of which 19 were considered as pollinators. The role of 5 spp. was uncertain in pollination, whereas, 4 spp. were considered as accidental visitor.Table-1, shows that member of Apidae, Xylocopidae, Vespidae, Formicidae,

Syrphidae, Muscidae, Calliphoridae, Sarcophagidae, Tenthridinidae, Danaidae, Pieridae, Amatidae, Noctuidae, Plutellidae, Meloidae, Coccinellidae, Scarabaeidae, Alydidae, Thripidae, Libellulidae and Coenagrionidaefamilies belonging to Hymenoptera, Diptera, Lepidoptera, Coleoptera, Hemiptera, Thysanoptera and Odonata orders visited onion flowers during the period of study. Earlier,Thapa (2006) observed over 50 species of insects visitors during the flowering periods, whereas, Georges et.al. (2014) recorded 22 species of insects on flowers of onion.

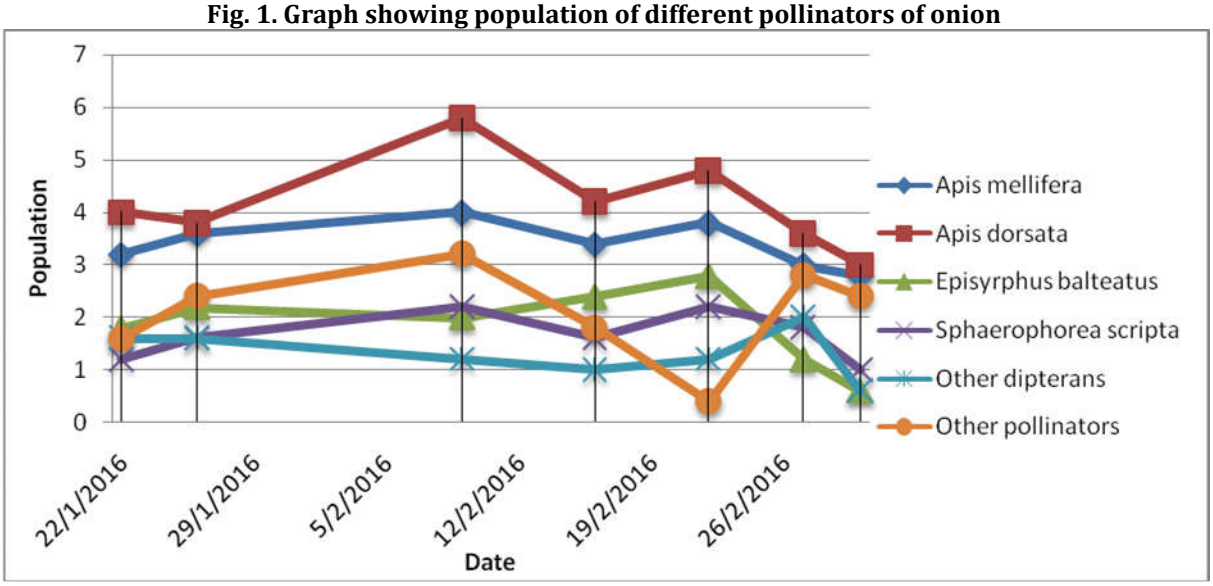
Among different families Apidae was containing maximum number of pollinators represented by 4 spp. This was followed by Xylocopidae and Syrphidae each containing two species of insects. Among the different orders Hymenoptera contains maximum number of species (8 spp.), followed by Diptera (6spp.). The relative abundance of insect pollinators and related insect fauna was recorded on the crop at regular intervals. The number of pollinators recorded per square meter of onion field is presented in Table-2.

Table-2: Observations for abundance of different pollinators per sq.m. in onion crop

	Pollinator	22/1/16	26/1/16	9/2/16	16/2/16	22/2/16	27/2/16	1/3/16	TOTAL	AVG.	Mean % population
1	*Apismellifera*	3.20	3.60	4.00	3.50	3.80	3.00	2.80	23.8	3.40	23.48
2	*Apisdorsata*	4.00	3.80	5.80	4.20	4.80	3.40	3.00	29.2	4.17	28.79
3	*Episyrphusbalteatus*	1.80	2.20	2.00	2.40	2.80	1.20	0.60	13.00	1.85	12.82
4	*Sphaerophoreascripta*	1.20	1.60	2.20	1.60	2.20	1.80	1.00	11.60	1.65	11.44
5	Other dipterans	1.60	1.60	1.20	1.00	1.20	2.00	0.60	9.20	1.31	9.08
6	Other pollinators	1.60	2.40	3.20	1.80	0.40	2.80	2.40	14.6	2.08	14.39
Total		13.40	15.20	18.40	14.50	14.40	14.20	10.4	101.4	14.48	2.41

On the basis of insect fauna recorded average number of insects recorded per square meter during the entire blooming period *Apisdorsata* was the most pre-dominant species with an average population of 4.17 insects/sq.m representing 28.79% of insect visitors. This was followed by *Apismellifera* the second dominant insect visitor with 3.40 insects/sq.m constituting 23.48% of insect fauna. The Syrphids Episyrphus *balteatus* and *Sphaerophoreascripta* rank third and fourth among the insect visitors (1.85 and 1.65 flies/ sq.m respectively) representing 12.82 and 11.44 % of the insect visitors respectively. Other dipterans in totality are represented by 9.08% of insect visitors with an average population of 1.31 insects/sq.m. Rest of the insect fauna represented 14.39% of the total insect visitors.

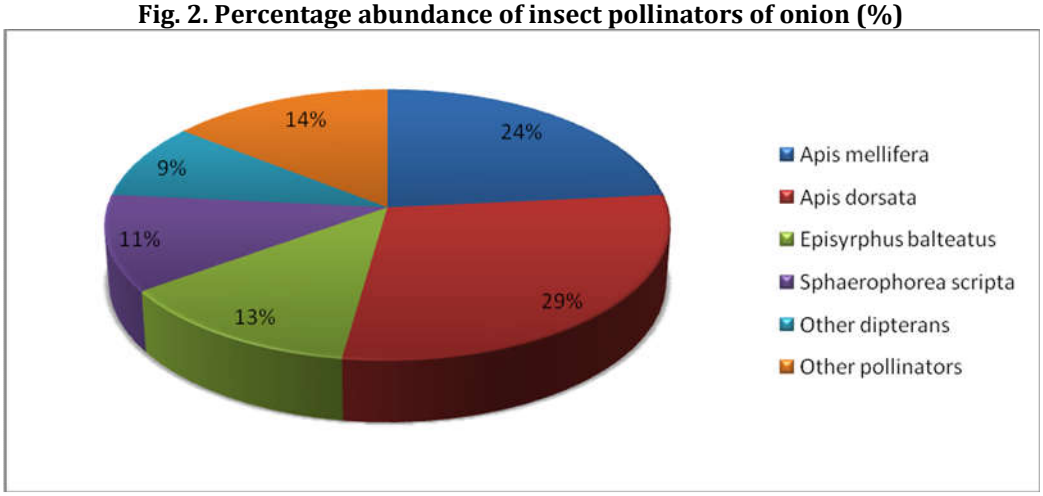
Fig. 1. Graph showing population of different pollinators of onion



Among the different species of insect visitors, honey bees were most dominant pollinator group representing more than 52% of the total pollinators present on the crop. Among the two honey bee species, the rock bee, *Apisdorsata* outnumbered the domesticated *Apismellifera*, the widely maintained

hive bee species of West Bengal. Considerable number of dipteran flies also visited the crop (more than 33% of total pollinator fauna), of which the Syrphids were most common. (fig.2)

Fig. 2. Percentage abundance of insect pollinators of onion (%)



Earlier Lorenzon and Martinho (1990-92),found high population of pollinators on onion flowers, of which most frequent were: *Apismellifera, Trigonaspinipes, Tetragoniscaangustula*, and species from the Mutillidae, Sphecidae, Vespidae, Bombylidae, Tachinidae and Bibionidae. Witter and Blochtein (2003) observed that, Hymenoptera and Diptera were the most abundant flower visitors of onion. Sajjad et al (2008) observed that, *A. dorsata*was the most abundant pollinator among bees, whereas, syrphid fly, *Episyrphusbalteatus* was most dominant among the dipteran flies in onion. The result of the present investigation is in clear agreement with the results obtained by earlier authors. However, there is much difference in the observed population density which is due to difference in location.

CONCLUSION

28 insect species of 7 orders and 21 families *viz*. Hymenoptera (Apidae, Xylocopidae, Vespidae, Formicidae), Diptera (Syrphidae, Muscidae, Calliphoridae, Sarcophagidae, Tenthridinidae), Lepidoptera (Danaidae, Pieridae, Amatidae, Noctuidae, Plutellidae), Coleopteran (Meloidae, Coccinellidae, Scarabaeidae), Hemiptera (Alydidae), Thysanoptera (Thripidae) and Odonata (Libellulidae and Coenagrionidae) belonging to 24 genera *viz*., *Apis, Xylocopa, Megachile, Vespa, Formica, Episyrphus, Sphaerophoria, Musca, Chrysomya, Sarcophaga, Athalia, Danaus, Pieris, Amata, Helicoverpa,Spodoptera, Plutella, Mylabris, Cheilomenes, Mausoleopsis, Leptochorisa, Thrips, Sympetrum* and *Enallagma*visited flowers of onion, which were classified as pollinators, uncertain pollinators, pests, predators and accidental visitors.

Among the different families Apidae contained maximum number of pollinators represented by 4 species. This was followed by Xylocopidae and Syrphidae each containing two species of insects. Among the different orders Hymenoptera contained maximum number of species (8), followed by Diptera (6).

*Apisdorsata*was the most pre-dominant species with an average population of 7.14 insects/sq.m representing 38.64% of insect visitors followed by *Apismellifera* (4.42 insects/ sq.m constituting 23.95%). The two species of syrphids*Episyrphusbalteatus* and *Sphaerophoreascripta* (1.85 and 1.65 flies/sq.m respectively) represented 10.08 and 8.96 % of the insect visitors, respectively.

The average number of insect visitors recorded per square meter during the experimental period was 3.08.

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REFERENCES

1. Banik (1990). Role of pollinating agents on seed production of shallot onion. *Bangladesh Journal of Plant Breeding and Genetics*,**3**: 15-22.
2. Georges T. and Fernand N. (2014). Foraging and pollination activity of *Apismelliferaadansonii*Latreille (Hymenoptera: Apidae) on flowers of *Allium cepa* L. (Liliaceae) at Maroua, Cameroon. *International Journal of Agronomy and Agricultural Research*,**5**(2): p. 139-153.

3. Lorenzon, M.C.A. andMartinho, M.R. (1992). Pollinators of flowering onions in Igarape, Minas Gerais State. *Anais da SociedadeEntomologica do Brazil,***21**(3): 383-389.
4. Roubik, D. W. (1995). Pollination of Cultivated Plants in the Tropics. FAO, Rome.
5. Sajjad, A.; Saeed, S. and Masood, A. (2008).Pollinator community of onion (*Allium cepa* L.) and its role in crop reproductive success. *Pakistan Journal of Zoo*logy, **40**: 451-456.
6. Thapa, R. B. (2006). Honeybees and other insect pollinators of cultivated plants. *Journal of Agriculture and Animal Science,***27**: 1-23.
7. Witter, S. and Blochtein, B. (2003). Effect of pollination by bees and other insects on the production of onion seeds. *PesquisaAgropecuariaBrasileira*, **38**(12): 1399-1407.

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