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DIVERSITY OF INSECT POLLINATORS ON SWEET BASIL (*OCIMUM BASILICUM* LINN.)

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ABSTRACT

Studies on diversity of insect pollinators in sweet basil were carried out at Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur. The insect pollinator diversity was recorded during the flowering period from 21/08/2017 to 29/10/2017 on sweet basil. The major insect pollinators belonged to 5 different orders: Hymenoptera, Lepidoptera, Coleoptera, Diptera and Hemiptera that were observed during different hours of the day. The mean lepidopteran pollinators ranged from 1.50 to 24.83, whereas mean hymenopteran and dipteran pollinators ranged from 3.00 to 13.00 and from 0.33 to 3.17, respectively.

Keywords: Sweet basil, Insect Pollinators, Insecta, Shannon- Weaver Diversity Index, Bee bowls.

INTRODUCTION

Among the medicinal and aromatic plants, the genus *Ocimum* is widespread over Asia, Africa and Central and Southern America; it appears to have its center of diversity in Africa. The first ever cultivation of basil is believed to be in India and is an extremely versatile group consisting of about 160 species (Pullaiah, 2006) with a geographic distribution spread over the tropical, sub tropical and warmer parts of the temperate regions. A systematic field investigation on the world distribution of the genus is still lacking. It is found throughout India, ascending up to 1800 m in the Himalayas and in the Andaman and Nicobar Islands (Pullaiah, 2006). Sweet basil (*Ocimum basilium* Linn: Lamiaceae), perhaps the most popular and widely used culinary herb, is a tender annual, aromatic plant with a spicy odour and flavour. Majority of the wild plants are entomophillic (Ollerton *et al.* 2011) and thereby insect pollinators form an essential component in the maintenance of biodiversity of plant communities and ecosystem functioning.

MATERIALS AND METHODS

To establish the diversity of insect pollinators, a field study on the standing crop of sweet basil grown at the Instructional farm, Rajasthan College of Agriculture, Udaipur was done. All the flower visiting insects were collected at different hours of the day (06:00-08:00, 08:00-10:00, 10:00-12:00, 12:00-14:00, 14:00-16:00 and 16:00-18:00 hours of the day) from ten randomly selected plants of sweet basil at different locations within the crop area. The sampling was done by transect sampling using an insect net at weekly intervals at different hours of the day as mentioned above.

Using the standard methodology of bee bowls for monitoring pollinator populations developed by the FAO, small cups painted on the inside with fluorescent yellow, white and blue paints were used. The bowls were filled half with soap solution (5%). Six bowls in each plot (2 of each colour) were placed 3 meter apart randomly and numbered at about canopy height. While collecting specimens weekly from the bee bowls a tea strainer was used and specimen tubes (as many as the number of traps) were taken for collection. The specimens from the strainer were transferred to a separate specimen tube, with proper label including the date of observation, crop, location and trap number in the crop. After returning to the lab, the specimens were washed with alcohol (70%) diluted in distilled water, dried on filter paper and then mounted using appropriate insect pins and labeled.

Yellow pan traps were used to catch many flying insects. Yellow pan traps are shallow trays painted yellow using either enamel yellow paint or fluorescent yellow. The tray was half filled with water and a few drop of liquid soap was added. The traps were placed on the ground in the field with 2 such traps in each replicate. The pan traps were kept for 24 hours for recording observations on flower visitors.

RESULTS AND DISCUSSION

The population dynamics of insect pollinators comprising 5 insect orders namely Lepidoptera, Hymenoptera, Diptera, Hymenoptera & Coleoptera was observed and has been presented in Table (1).

Table 1. Weekly population trend of insect pollinators visiting sweet basil on transect sampling during *kharif*, 2017

SMW	Dates of Observation	Mean abiotic factors				Diurnal mean insect pollinators of different orders				
		Atmospheric Temperature (°C)	Relative Humidity (%)	Rainfall (mm)	Sunshine (hours)	Lepidoptera	Hymenoptera	Diptera	Coleoptera	Hemiptera
35	27/08/2017	27.37	82.08	15.31	5.41	16.50	1.83	1.67	0.17	2.33
36	03/09/2017	25.37	85.71	10.26	2.24	5.83	5.33	0.83	0.17	0.83
37	10/09/2017	26.06	73.93	-	5.33	5.50	13.00	1.50	0.33	2.17
38	17/09/2017	26.18	83.86	5.51	3.84	24.83	3.00	1.67	0.50	1.00
39	24/09/2017	26.62	62.65	-	5.79	4.67	4.33	0.33	0.17	0.67
40	01/10/2017	26.99	54.29	-	8.37	6.33	4.33	0.67	0.17	0.67
41	08/10/2017	26.57	46.79	-	7.79	6.17	5.67	1.67	0.67	0.17
42	15/10/2017	26.79	46.50	-	6.31	6.50	15.17	3.17	-	0.17
43	22/10/2017	26.96	39.21	-	9.01	6.67	15.17	1.50	-	0.17
44	29/10/2017	23.81	65.86	-	8.97	1.50	5.83	0.33	-	-
Coefficient of correlation between insect pollinators and mean atmospheric temperature						0.34	0.09	0.45	0.14	0.29
Coefficient of correlation between insect pollinators and mean relative humidity						0.49	-0.57	-0.25	0.19	0.66
Coefficient of correlation between insect pollinators and mean sunshine hours						-0.45	0.28	-0.11	-0.25	-0.50

Lepidopteran pollinators

The mean lepidopteran pollinators ranged from 1.50 to 24.83. The maximum mean lepidopteran pollinators of 24.83 was recorded during 38th SMW when the mean atmospheric temperature was 26.1°C, mean relative humidity 83.86 per cent, mean rainfall 5.51 mm and mean sunshine hours 3.84 hours. The minimum mean lepidopteran pollinators were recorded with 1.50 during the 44th SMW.

Hymenopteran pollinators

The mean hymenopteran pollinators ranged from 3.00 to 13.00. The maximum mean hymenopteran pollinators with 13.0 was recorded during 37th SMW with mean atmospheric temperature as 26.06°C, mean relative humidity 73.93 per cent and mean sunshine hours 5.3 hours. The minimum mean hymenopteran pollinators were recorded during 44th SMW with 0.83 mean pollinators.

Dipteran pollinators

The mean dipteran pollinators ranged from 0.33 to 3.17. The mean maximum pollinators (3.17) of Diptera was recorded during 42th SMW with mean atmospheric temperature of 26.79°C, mean relative humidity 46.50 per cent and mean sunshine hours 6.31 hours. The mean minimum dipteran pollinators (0.33) were recorded during 44th SMW.

Coleopteran pollinators

The mean maximum coleopteran pollinators were observed during 41th SMW with 0.67 mean pollinators with the mean atmospheric temperature of 26.57°C, mean relative humidity 46.79 per cent and mean sunshine hours 7.79 hours.

Hemipteran pollinators

The mean maximum hemipteran pollinators were recorded during 35th SMW with 2.33 mean pollinators with mean atmospheric temperature of 27.3°C, mean relative humidity 82.08 per cent, mean rainfall 15.31 mm and mean sunshine hours 5.41 hours.

Present findings are in close conformity with the earlier work of Banjo *et al*. (2006), who found Hymenoptera as the most abundant order on *Ocimum basilicum* accounting for 50.7 percent of the total pollinators. Similarly, Tri Atmowidi *et al. (*2007) recorded a total of 5,955 pollinator insects associated with *Brassica rapa*. They belonged to 19 species and 4 orders (Hymenoptera, Lepidoptera, Coleoptera and Diptera, for 95, 2.17, 2.07 and 1%, respectively); while, Chaudhary (2006) reported 47.10 per cent hymenopterans visiting fennel (*Foeniculum vulgare* Mill.) including six Apoidea species and dipterans (50.3%) that were the most prominent groups of the total visitors. Sharma and Abrol (2015) observed that *Ocimum kilimandscharicum* Guerke was found to be pollinated by insects belonging to 4 orders, 8 families and 14 species. The flowers of *Ocimum kilimandscharicum* were visited abundantly by *Amegilla zonata* (L.) followed by *A. dorsata* and *A. cerana.*

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