INDIAN STREAMS RESEARCH JOURNAL
ISSN NO : 2230-7850
IMPACT FACTOR : 5.1651 (UIF)
VOLUME - 12 | ISSUE - 12 | JANUARY - 2023

FORAGING ACTIVITIES OF INSECT VISITORS ON SUNFLOWER IN SIDHI DISTRICT

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ABSTRACT:

Studies on the diversity, foraging activity and abundance of the insect visitors belonging to Lepidoptera, Hymenoptera, Diptera and Coleoptera were carried out on sunflower (Helianthus sp.) commencing from 6.00 hrs to 15hrs. during January, 2022 to March, 2022 at five time periods i.e., 8-9 am, 10-1l am, 12-1 pm, 2-3 pm and 4-5 pm at Sidhi. 17 insect species belonging to 10 families under four orders of insects were found to visit on the sunflower. Species diversity was found maximum among order Lepidoptera. During the total study period, it was observed that, the abundance of Hymenoptera (61.33%) was maximum followed by Diptera (18.86%), Coleoptera (11.66%) and Lepidoptera (8.15%). Of those, Diacammarugosum (13.78%) of Hymenoptera was found as dominant insect visitor also found as casual visitors of the sunflowers.

KEYWORDS: *Sunflower, Insect species, foraging activity and abundance.*

INTRODUCTION:

Pollination of agricultural crops is an important ecosystem service that enables plants to produce fruits and seeds. Approximately 70% of the tropical crop species depend on pollinators for optimum yields. Sunflower is one of the fastest growing oilseed crops in India popularly known as 'Surajmukhi'. Although it was commonly accepted that the sunflower was first domesticated in Mexico around 2600 BC. In India, sunflower as an oilseed crop was introduced in 1969. Prior to which it was used mainly as an ornamental plant. Nowadays, other than the edible oil the leaves of the sunflower can be used as cattle feed, while the stems contain a fibre which may be used in paper production.

The sunflower *(Helianthus* sp.) under the order Asterales, family Asteraceae, possesses a large inflorescence (flowering head, a group of several flowers) [Bidlack & Shelly, 2011]. The plant has a rough, hairy stem, broad, coarsely toothed, rough leaves, and circular flower heads. Each flower of the sunflower consists of the typical structures of a flower; receptacle, peduncle, sepal, petals, stamen, and a pistil.

Sunflower is a self-incompatible and depends on insect (mainly bees) for cross pollination and seed setting. Therefore, it is essential that adequate pollinators are present in the field for pollen movement and seed set. But there is no published data on pollination and pollinators of sunflower in West Bengal. Therefore, a study was conducted at Phaldi, near Duttapukur (North 24 parganas, West Bengal, India) to document the diversity of insect visitors, their foraging activity and the effective pollinators of sunflower. Altogether, 17 insect species belonging to 10 families under four orders of insects were found to visit the sunflower.

MATERIALS AND METHODS:

The study was conducted at Sidhi, near Churhat during January-2022 to March 2022. Insect visitors of sunflower were collected by hand-picking and insect net throughout the flowering period. The lepidopterans were mostly identified in the field and other insect visitors were identified from Zoological Survey of India, Kolkata. All the collected insects were submitted to the Department of Zoology (Entomology section), Govt. SGS PG College, Sidhi. Diurnal insect visitors of sunflower were observed and recorded in randomly selected five plots of 25 sq.ft size for 10 minutes at two-hourly intervals and once in a week for five weeks of flowering period. The abundance of bees, wasps, flies and other visitor insects on sunflower was calculated for entire blooming period.

On onset of about 30% flowering, insect pollinators were collected with hand net and were killed in insect killing jar (having potassium cyanide). Foraging behavior of different pollinators was recorded by observing visitation rate (number of the flower visited by different insect pollinators per minute) and stay time on twenty randomly selected flower heads by using stop watch. Time was counted when insect landed on flower excluding the time, it circled on flower. Data of foraging behavior was recorded three times (0900, 1300 and 1700 hours) in a day on weekly basis throughout the flowering season. Pollinator's abundance was determined during the flowering season on thirty randomly selected flower heads.

DISCUSSION:

Among the diverse flower visitors of sunflower at the research area, Insect pollinators comprise honeybees especially the commercial *A. mellifera* species was abundant and the most frequent pollinator of sunflower. It has been known to participate in its pollination with major share in flowers visitation and crop yield (Hoffman, 1994; Moretti et al., 1993). Nderitu et al. (2008) reported 14 species visiting sunflower with maximum contribution of *A. mellifera* (Hymenoptera) followed by the Lepidopteron species.

Radford et al. (1979) found non-*Apis* bees as inefficient pollinators but their presence enhanced honeybee pollination efficiency. Hymenopterans crop pollinating insects are the most abundant with different *Xylocopa* species varying different in different locations. These carpenter bees are the most easily observable species due to their buzzing nature and large size with shinning bright colors. Previously pollinators from four insect orders including Hymenoptera, Lepidoptera, Diptera and Coleoptera has been reported whereas presently first three orders were observed (Nderitu et al., (2008). This variation might be due to spatial variation and most generally the coleopteran visitors are very small in size and often neglected by the observers. Maximum insect pollinators of sunflower have been from Hymenoptera, Lepidoptera and Diptera with sixty percent hymenopterans out of twenty visiting species (Arya et al., 1994; Satyanarayana and Seetharam, 1982; Vaish et al., 1978).

The number of *A. mellifera* and *X. Fenestrate* visiting sunflower peaked during 0800 hours. Present and previous studies strongly showed relationship in *A. mellifera* activity at early and late hours of the day. This might be due to their activeness with temperature (Kumar et al.,1994; Morgado et al., 2002; Santana et al., 2002). They also observed the reduced foraging after 1000 hours of the day which regained in later day hours. However, the variation in bee density might be due to variation in different climatic environments in different parts of the worlds (Parker, 1981; Satyanarayana and Seetharam, 1982). Foraging behavior of honey bees varied during different times of the day as observed by du Toit (1988) that activity start at early morning and peak observed between 9:00-10:00 hours.

Present results are also in confirmation with Nderitu et al. (2008) who reported peak activity of *Apis* and non-*Apis* bees between 1000 to 1400 hours. However, variation in foraging numbers at variable time of the day were also observed suggesting presence of nectar and pollen in flower heads and unfavorable high temperature (Free, 1964; Paiva et al., 2003; Schinohara et al., 1987) with variation in the most frequent visitors for pollination including *X. fenestrate, X. olivacea* and *Ceratinia laevifrons* and *Phaseolus vulgaris* (Kingha et al., 2012; Moalif and Al-Azzawi, 1989).

CONCLUSION:

Sunflower capitulum in bloom is highly attractive to various insect species especially those belonging to Hymenoptera and Lepidoptera. It is also evident that flower visitation by *A. mellifera* increased sunflower yield (total number of seeds, seed filling percentage, seed weight). Behavioral interaction of non-*Apis* bees has indirect effect on crop yield, possibly through improving efficiency of *A. mellifera*. Hence, conservation of bee species by encouraging increased forage crops in the vicinity of cropped areas and avoidance of insecticide application during flower head stage of sunflower to achieve the pollination services of naturally existed insect pollinators for higher crop yield is recommended.

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