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Research Paper

Polliniferous Plants Associated With Honey Bee (Apis Cerana) in Aizawl District, Mizoram Northeast India.

Botany

KEYWORDS : Honey Bee, Apis cerana, Polliniferous plants, Aizawl, Mizoram, Northeast India.

Prof.Ramachandra Laha — Department of Botany, School of Life Sciences, Mizoram University, Aizawl- 796004. Mizoram. India.

Lalhmangaihi Ralte — Department of Botany, Mizoram University, Aizawl. Mizoram – 796004, India

ABSTRACT

A study of polliniferous plants from honey bees was made in Aizawl district, Mizoram state. Bees are the most important pollinator taxon, therefore understanding the scale at which they forage has important ecological implications and conservation applications. The foraging ranges for most bee species are unknown. After the survey, total of 18 families were identified from 36 species. It also provide information on pollen analysis of honey samples. Conservation of polliniferous plants is important for maintaining honeybees.

1.Introduction

Honey bees have been describe as the most useful of all insects known to man, because it provides man as well as other forms of life with basic services to their survival [Adjare 1990]. Bees are the primary pollinators for most of the ecological regions of the world [Axelrod 1990; Bawa 1990]. Bee foraging distance also affects agricultural production [Greenleaf et. al. 2007]. Traditional approaches to characterizing relationship between plants and pollinators rely on time intensive observations of individual interactions [Davidar et. al. 1993; Murali and Sukumar 1994 ; Mitchell et. al. 2009]. Honey bees collect bee pollen in order to use it as food for all the developmental stages in the hive. Honey bee produce honey, bee wax, propolis, royal jelly and they are known to play a vital role in the pollination of plants [Adjare 1990 ; Rahman 2006]. Analysis of pollen contents of honey is useful in the determination of the geographical and botanical origin of particular type of honey [Sharma 2011].

The objective of this study is to document plants that could serve as bee foraging floral species, understand honey bee plants relationship and their relative distribution in the region. The study will provide information on bee foraging species pollen, information on nectar and pollen source for honey bee (Apis cerana) and also pollen source from honey. This type of data helps beekeeper to know the honey formation from flowering plants [Sharma 2011]. This knowledge will be vital to prospective commercial bee keepers and policy makers willing to incorporate beekeeping in programmes aimed at reducing unemployment and poverty [Abdullahi et. al. 2011]. Thus identification of bee flora including their abundance, distribution and floristic information are essential for good yield of honey [Shivaram 1995].

2. Study Site

Aizawl is the largest district in the state, but still very remote. Aizawl is located at 3715 feet from the sea level, weather in summer: max:30oC min:20oC and winter: max: 21oC min 11oC with rainfall 3,000m and altitude of 1132 metres/3715 Ft. The district occupies an area of 3576.31 km^2. Aizawl lies just north of Tropic of cancer. In Aizawl district different villages like Tanhril, Melthum, Durtlang, Sihphir, Hlimen and Falkland were surveyed for study. Within each villages sites were selected randomly where available beekeeping area located.

3. Methodology

The field research period lasted from October 2010 to September 2011. Stratified random sampling procedure were used in which sampling was carried out on randomly chosen transect of 1,000m in length of the area. The start and end of each transect marked with a flag. On each study visit observation for bee foraging plants and honeybees done on transects chosen within the sampling units. Plants seen with flowers within a 50m radius of each transect visited and observed for the presence of honeybees. The honeybee time of visitation was observed from 6:30a.m to 9:30a.m. and 2p.m. to 4:30p.m. monthly in the selected sites. The success of foraging attempt ascertained, the plant recorded as bee foraging species after at least three honeybees visits the flowers simultaneously within the observation period of 10 minutes [Abdullahi et. al. 2011; Bawa 1990]. A list of most important polliniferous species for the selected sites was developed on the basis of information and recorded with photograph of the specimens. Data on flowering phenology were derived on regular monitoring of marked individuals of the different species, through formal and informal interviewed with the local beekeepers. The plant samples were collected and processed following the routine method of plant collection and herbarium technique [Jain and Rao 1977]. The specimens have been identified with the help of relevant floras and standard literature [Hooker 1989; Kanjilal et. al. 1982]. The sample of mature pollen grains are collected from flower buds from the field after the plant has been confirmed as polliniferous plants by visual observation that the bees are foraging on plants either for nectar or pollen or both. The mature pollen grains of the identified polliniferous plants species was collected, preserved in 70% alcohol for investigation [Shubharani et. al. 2013]. The preserved materials was prepared by acetolysis method according to Erdtman (1960), the prepared slides was studied under light microscope for morphological studies and photomicrograph of pollen grain was taken. Twelve honey samples were analysed which were collected during 2010-2011 from different villages of Aizawl. 2ml of honey was dissolved in 10ml of distilled water, centrifuged and sediment obtained was treated with 5ml glacial acetic acid after decanting of which the material was subjected to acetolysis [Erdtman 1960]. Pollens slides were prepared from each samples, pollen types were identified with the help of reference pollen slides of the local flora.

4. Observation and Discussion

The study depict the status of polliniferous plants in the region found a total of 36 plants, distributed among 18 families. The dominant family with the largest number of six species belonged to Compositae, followed by Cucurbitaceae with five species, Leguminoseae, Malvaceae and Myrtaceae with three species, Euphorbiaceae, Lythraceae, and Rutaceae with two species each, and Amaranthaceae, Anacardaceae, Brassicaceae, Caricaceae, Oxalidaceae, Poaceae, Rosaceae, Rubiaceae, Solanaceae and Tropeaeolaceae with one species each. (Table: 1, Figure 1)

The colour of the polliniferous flower liked by the bees show the most prefer or dominant colour visited by bee is white (14 species) 39%, followed by red (10 species) 28%, yellow (5 species) 14%, violet (4 species) 11%, pink (2 species) 5% , and orange (1 species) 3%. (Table: 1, Figure 2). The status on the habitat of the polliniferous plants in the district show the dominant species shrubs, followed by trees, herbs and climbers as such shrubs (14

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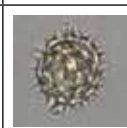
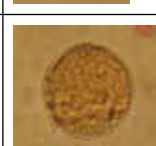
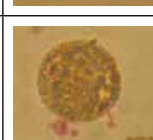
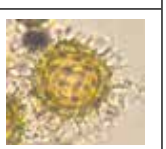
species) 39%, trees (10 species) 28%, herbs (6 species) 17%, and climbers (6 species)16%. (Table:1, Figure 3). The study on the flowering month of the polliniferous plants highlight that most number of plants flower in the month of June (20 species)16%, followed by May (15 species) 12%, April (14 species) 11%, July (13 species) 10%, March and August (11 species) 10% and 11%, February (8 species) 6%, followed by January and September with 5% and November and December with 6% (7 species each) and the least number of flowering plants is October (6 species) 5%. (Table: 1, Figure 4). The study on pollen analysis of honey provide important information on the available nectar and pollen sources of the study area (Table: 1) i.e. the type of forage and pollen type.

Some plant species readily produces nectar and their flowering period is longer if compared with other species [Sharma 2011]. Some flowering plants may be having good quality of nectar. The foraging activities of plant pollinators like honey bees is known to enhance the performance of a cross pollinated crop in a kind of mutualistic relationships and bees are the most important pollinator taxon. [Greenleaf et al. 2007].

Table 1: Polliniferous plants from Aizawl district with flowering phenology.

Sl.No	Scientific Name	Local Name	Family	Habit	Flowering period	Colour of Flower	Type of forage	Pollen type
1.	*Ageratum conyzoides* Roxb.	Vaihlenhlo	Compositae	Herb	May-Aug	Violet	Nectar and pollen	
2.	*Althaea rosea* L.	Anthur	Malvaceae	Shrub	Jan-Dec	Red	Nectar and pollen	
3.	*Amaranthus sps.* L.	Zamzo	Amaranthaceae	Shrub	August	Red	Nectar and pollen	
4.	*Averrhoa carambola* L.	Theiherawt	Oxalidaceae	Tree	June	Pink white	Pollen	
5.	*Bauhinia variegate* L.	Nauban	Leguminosae	Climber	Feb-May	Pink	Nectar and pollen	
6.	*Bidens tripertite* L.	Chabet	Compositae	Herb	June-July	White	Nectar and pollen	
7.	*Callistemon lanceolatus* Sweet.	Bottle Brush	Myrtaceae	Tree	Feb-June	Red	Nectar	
8.	*Carica papaya* L.	Thingfanghma	Caricaceae	Shrub	July-August	White	Nectar and pollen	
9.	*Citrus limon* (L.) Burm.f.	Limbu	Rutaceae	Tree	March-May	White	Nectar and pollen	

10.	*Citrus reticulate* Blanco.	Serthlum	Rutaceae	Tree	Sept-Oct	White	Nectar and pollen	
11.	*Coffee arabica* L.	Coffee	Rubiaceae	Shrub	September	Red	Pollen	
12.	*Cosmos* sp.	I love you par	Compositae	Shrub	Nov-Dec	Yellow	Nectar and pol len	
13.	*Cucumis sativas* L.	Fanghma	Cucurbitaceae	Climber	Jan-Dec	White	Nectar and pol len	
14.	*Cucurbita pepo L.*	Mai	Cucurbitaceae	Climber	May-June	Yellow	Nectar and pol len	
15.	*Euphorbia pulcherrima* Willd.	X'mas par	Euphorbiaceae	Shrub	Dec-Feb	Red	Nectar and pol len	
16.	*Hibiscus rosa sinensis* L.	Midum pangpar	Malvaceae	Shrub	Jan-Dec	Red	Nectar and pol len	
17.	*Ipomea batatas* L.	Kawlbahra	Cucurbitaceae	Climber	Nov-Feb	Violet	Nectar and pol len	
18.	*Jatropha curcus* L.	Kangdamdawi	Euphorbiaceae	Tree	March-April	White	Nectar and pol len	
19.	*Lagerstromia speciosa*(L.) Pers.	Thlado	Lythraceae	Tree	April-June	Violet	Nectar and pol len	
20.	*Malvaviscus arboreus* Cav.	Palthing	Malvaceae	Shrub	May-August	Red	Nectar and pollen	
21.	*Mangifera indica* L.	Theihai	Anacardaceae	Tree	March-April	White	Nectar and pollen	

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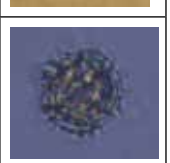
22.	*Mimosa pudica* L.	Hlonuar	Leguminosae	Herb	April-May	Violet	Nectar and pollen	
23.	*Momordica charantia* L.	Changkha	Cucurbitaceae	Climber	June-August	Yellow	Nectar and pollen	
24.	*Psidium guajava* L.	Kawlthei	Myrtaceae	Tree	April-June	White	Nectar and pollen	
25.	*Punica granatum* L.	Pomegranate	Lythraceae	Shrub	May-June	Red	Nectar	
26.	*Raphanus sativas* L.	Mula	Brassicaceae	Herb	March-April	White	Nectar and pollen	
27.	*Rosa macrophylla* Lindl.	Rose	Rosaceae	Shrub	Jan-Dec	Red	Nectar	
28.	*Sechium edule (Jacq.)Sw.*	Iskut	Cucurbitaceae	Climber	June-July	White	Nectar and pollen	
29.	*Solanum melongena* L.	Bawkbawn	Solanaceae	Shrub	June	White	Nectar and pollen	
30.	*Spilenthes acmella* L.	Ankasa	Compositae	Herb	June-Aug	Yellow	Nectar and pollen	
31.	*Syzgium cumini*(L.)Skeel	Lenhmui	Myrtaceae	Tree	March-May	White	Nectar and pollen	
32.	*Tamarindus indica* L.	Tengtere	Leguminosae	Tree	June	White	Nectar and pollen	
33.	*Tithonia diversifolia* Hemsl.	Bawngpupar	Compositae	Shrub	Sept-November	Yellow	Nectar and pollen	

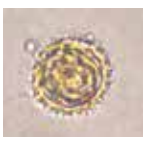
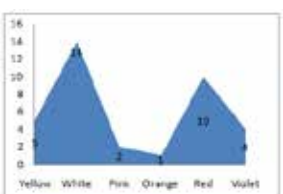
34.	*Tropaelum majus* L.	Serthlum rawngpar	Tropaeolaceae	Herb	June	Orange	Pollen	
35.	*Zea mays* L.	Vaimim	Poaceae	Shrub	July	Yellow	Nectar and pollen	
36.	*Zinnia elegans* Jacq.	Sappangpar	Compositae	Shrub	June-Aug	Red	Nectar and pollen	

Figure 1 . Family wise distribution of plants.



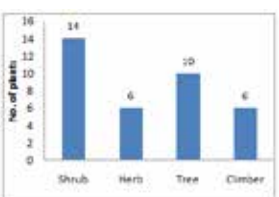


Figure 2. Colour of the flower visited by bee . Figure 3. Habitat of the Polliniferous plants.

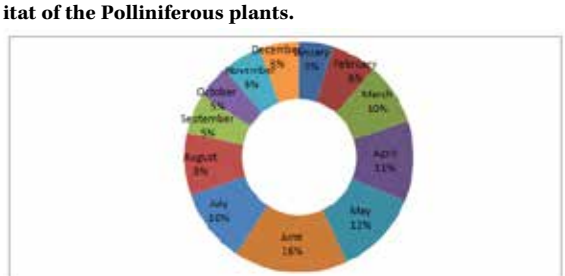


Figure 4 . Flowering month of polliniferous plants with percentage.

5. Conclusion

This study showed that bee collects their nectar and pollen from the plants available in the area. Identification of bee flora helps in providing efficiency of the bee industry of the region. This type of data helps the bee keeper to know the honey formation from flowering plants and the findings has significant implications for the conservation, management of the bee flora. Thus they can take appropriates steps to develop apiculture of the indigenous community.

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