

Original Research Article

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Weed Flora, A Rich Foraging Source for Little/Dwarf Bee *Apis florea* Fabricius (Hymenoptera: Apidae) in Madurai District, Tamil Nadu

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ABSTRACT

Keywords

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Beekeeping industry, is one of the important agricultural and forest based rural industries in India, which mainly involves in large scale production of honey and related products, besides they play a vital role in pollination of various crops. Beekeeping is entirely dependent on the types of flowering plants available in any given area. It is not only the total abundance, that is important, but also the duration of time for which bee forage is available. The present study was conducted at Agricultural College & Research Institute, Madurai (TNAU) for a period of one year (May 2018 to April 2019) to identify the existing bee flora and to determine honey flow and honey dearth period and to develop the floral calendar for *Apis florea*. The flowering plants were observed for the activities of honey bees and their foraging behaviour. The study revealed that *A. florea* was found to forage on various group of species among them namely, weed species dominated the floral preference.

Introduction

Honey bees have fascinated the mankind since prehistoric times. Honey bees are useful to the man and environment in many ways. Honey bees are eusocial insects belonging to hymenopteran order. They produce valuable and precious honey, pollen, wax, royal jelly and besides they play a major role in pollination of various crops. Honey bees and plants are said to be coevolved and mutualistic in nature, since honey bees depends on plants for pollen and nectars as

source of food and similarly plants depends on honey bees for pollination. The contribution of insect pollination to the worldwide agricultural production is about 153 billion Gallai (2009). Beekeeping is the only agro based industry with which minimum expense invested to obtain maximum income. The successful beekeeping not only depends on the better strain of the honey bee but also depends on the abundance and occurrence of various flowering plants in any particular area, Free (1970) and Akkrathanakal (1987).

However, the flowering plants produce blossoms during different seasons of a year. Depending upon the climate, topography and soil type, the time of flowering may even vary for samenessiferous plants.

Hence, floral diversity of particular area is to be thoroughly understood for maintaining the successful beekeeping in the apiary Rodinov (1986)

Five species of honey bee are prevalent in India they are *Apis dorsata*, *Apis florea*, *Apis ceranaindica*, *Apis mellifera* and *Trigonairridipennis*. Among these, *Apis florea* and *Apis dorsata* are considered as wild bees as they are non domesticated. *Apis florea* is known as little or dwarf bee due to their small size and they build combs in the branches of trees and shrubs. They produce little quantity of honey around 500 to 1 kg / year/ comb and they play a vital role in pollination of various agricultural and horticultural crops. Considering, these aspects the present study deals with floral diversity and floral calendar of *Apisflorea* in Madurai district, Tamil Nadu.

Materials and Methods

Study area and location

The study was conducted at orchard, Agricultural College & Research Institute, Madurai District of Tamil Nadu, India, which is located at latitude of 9° 55'25.79" N, longitude of 78°05'27.00" E and 331 MSL with an annual rainfall of 840mm.

The area was located under foot hills of Yanaimalai rock surrounded by major pasturage flora, which continuously supplies floral rewards to the honey bee.

Little bee hives domesticated from trees and shrubs (in and around the study area) were maintained in the study area. The study was

conducted during May 2018 to April 2019.

Floral rewards and floral resources

The flowering plants were continuously monitored for a week to observe the foraging activity of and foraging plants of little bee. The visual observations were made from 06-18.00 hrs for a day and if 3 bees were found for atleast 10 minutes period of time then the plants were considered as successful bee foraging plants as described by Bhalchandra *et al.*, (2014). Further, these foraging plants were classified into pollen source, nectar source and both nectar and pollen source based on the foraging behaviour. If the bees let their proboscis into the nectaries of the flowers then they were considered as nectar source; if they get loaded with pollen in its corbicula of hind leg then they were classified as pollen source and if both activities were found simultaneously in the same plant, then they were grouped into both nectar and pollen source plants.

The plant species were identified with the help of published reports, articles, literatures and online sources. Honey flow period and honey dearth period have been identified by observing the honey flow of the colony, abundance and frequent visit of bee in the flowers of the plants and floral rewards (Fig. 2).

Results and Discussion

Among all the floral species the weed species dominated the floral diversity to a total of 30 species belonging to 16 families (Table 1). The major source of nectars and pollens to the little bee, *Apis florea* were *Tridax procumbens*, *Mimosa pudica*, *Euphorbia pulcherima*, *Cyperus rotundus*, *Crotolaria juncea*, *Trianthema portulacastrum* and *Tribulus terrestris*.

This was in accordance with Bhalchandra *et al.*, (2014) who identified the bee foraging

plants and formed the floral calendar for the study area of Anjaneri and Dugarwadi hills. He reported that 52 plant species (29 agricultural crops and 22 wild plants mostly weeds species) were identified as bee foraging plants. Identification of bee foraging plants improves the efficiency of commercial

bee keeping and reported that 150 plant species were identified as bee foraging plants in Annamalai nagar, Chidambaram. The honey flow period coincides with January, February and March (Pushpalatha and Hariprasad, 2015).

Table.1 Floral diversity of *Apis florea* in weed ecosystem of Agricultural College and Research Institute, Madurai district, Tamil Nadu

SL. NO.	Common name	Scientific name	Family	Flowering period	Source abundance
1	Amaranthus	<i>Amaranthus viridis</i>	Amaranthaceae	Jan- Dec	N
2	Node flower	<i>Allmania nodiflora</i>	Amaranthaceae	July - Mar	NP
3	Mexican poppy	<i>Argemonemexicana</i>	Papaveraceae	Nov- Mar	P
4	Bassati	<i>Asystasia spp.</i>	Acanthaceae	June - Dec	NP
5	Alternenthera	<i>Alternenthera sessilis</i>	Amaranthaceae	Apr- July	N
6	Adhajhara	<i>Achyranthespp</i>	Amaranthaceae	Jan - Dec	NP
7	Malabar nut	<i>Adathodavasica</i>	Acanthaceae	Apr – Nov	NP
8	Bimbal	<i>Cyperusrotandus</i>	Cyperaceae	Jan - Dec	P
9	Congress weed	<i>Partheniumhysterophorus</i>	Asteraceae	Jan - Dec	P
10	Indigofera	<i>Indigofera sp.</i>	Fabaceae	Jun - Aug	NP
11	Amar vel	<i>Cuscutareflexa</i>	Convolvulaceae	July - Oct	P
12	Sunhemp	<i>Crotolariajuncea</i>	Fabaceae	July - Sept	N
13	Railway creep	<i>Ipomeapulchella</i>	Convolvulaceae	Aug - Sept	NP
14	Bankas	<i>Justiciasp</i>	Acanthaceae	Aug – Oct	NP
15	Bala	<i>Sidasp</i>	Malvaceae	Sep – Dec	NP
16	Bodasaram	<i>Sphaeranthussp</i>	Asteraceae	Oct - Apr	NP
17	Desert horse	<i>Trianthemaportulacatrum</i>	Azioaceae	Jan - Dec	NP
18	Ruellia	<i>Ruelliatuberosa</i>	Acanthaceae	Jun - Nov	NP
19	Gomidi	<i>Hygrophilaauciculata</i>	Acanthaceae	July - Feb	NP
20	Chirota	<i>Desmodiumsp</i>	Fabaceae	Aug - Mar	NP
21	Pucture vine	<i>Tribulusterrestis</i>	Zygophllaceae	Jan - Dec	NP
22	Halunda	<i>Vignatrilobata</i>	Fabaceae	Mar - May	NP
23	Iron weed	<i>Vernoniasp</i>	Asteraceae	July - Sep	NP
24	Tridax	<i>Tridaxprocumbens</i>	Asteraceae	Jan- Dec	NP
25	Bochokand	<i>Typhasp</i>	Typhaceae	May - July	P
26	Indian borage	<i>Trichodesmasp</i>	Boraginaceae	Jan - Dec	NP
27	Indian sorrel	<i>Oxalis sp</i>	Oxalidaceae	Feb - July	NP
28	Touch me not plant	<i>Mimosa pudica</i>	Fabaceae	Jan- Dec	NP
29	Poinsettia	<i>Euphorbia pulcherima</i>	Euphorbiaceae	Nov- Feb	NP
30	Crown flower	<i>Calotropis gigantea</i>	Apocynaceae	Jan - Dec	NP
31	Thuthi	<i>Abutilon sp</i>	Malvaceae	Jan - Dec	NP

Fig.1 Group wise categorization of weed flora based on bee foraging behaviour

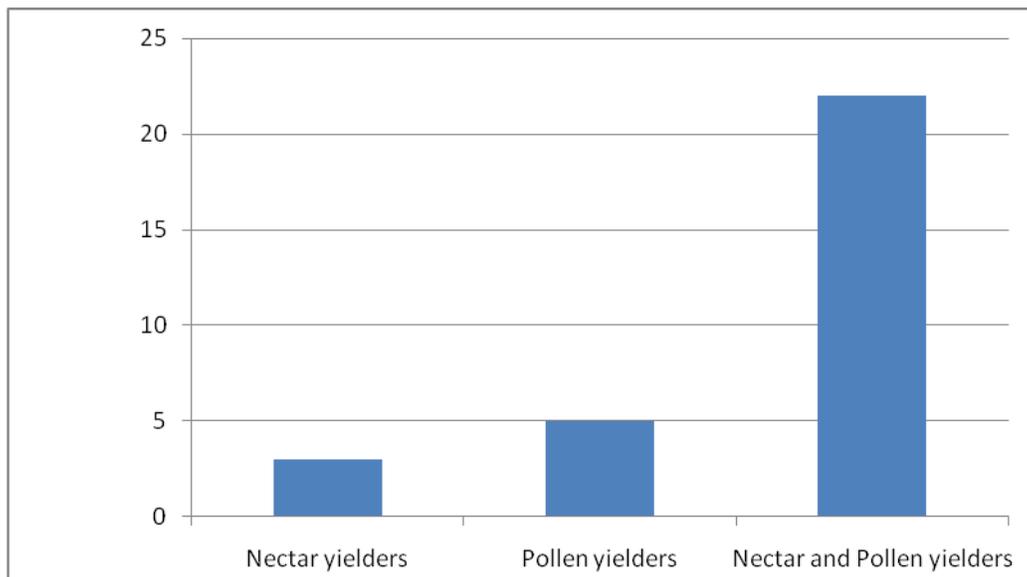
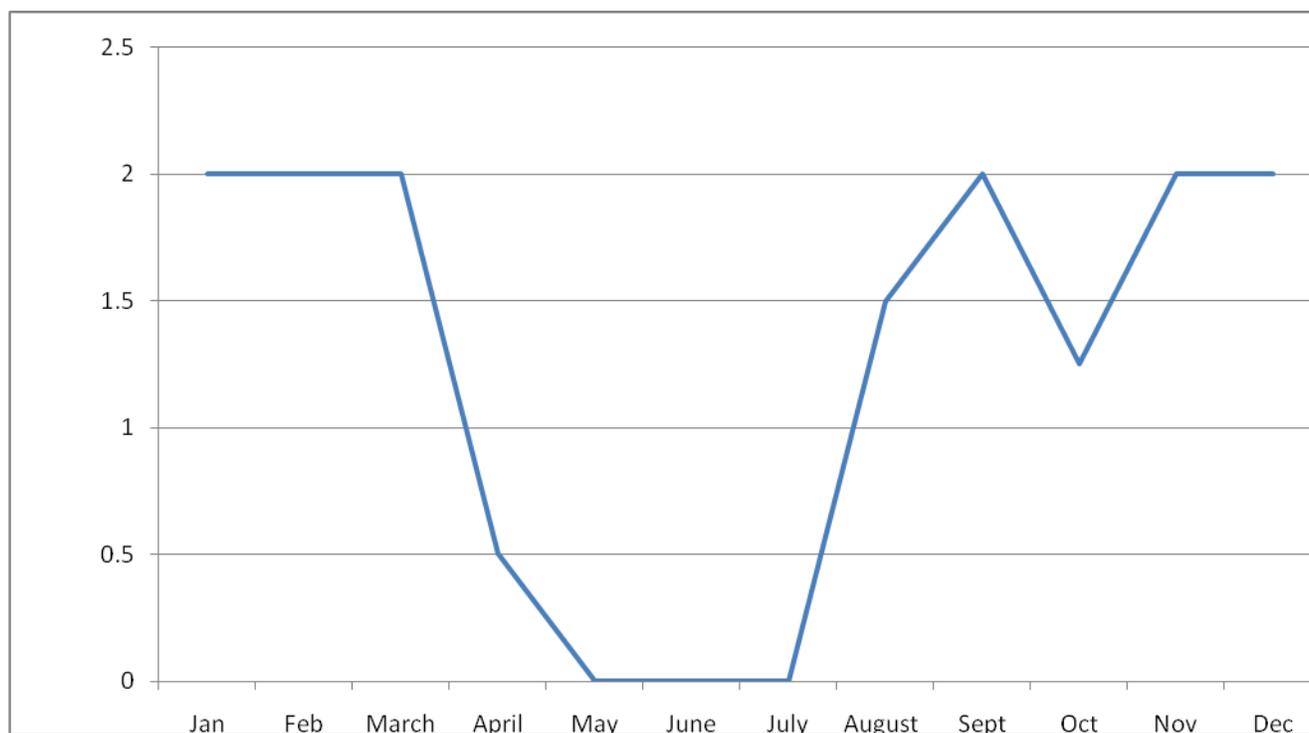


Fig.2 Honey flow period (May 2018 to April 2019)



Raghunandan and Basavarajappa, 2014 reported that 252 plants species belonging to 74 families as successful bee foraging plant species. In which trees contributed major (49.3%) followed by herbs (23.5%), shrubs

(21.7%) and Climbers (5.5%). The diversity found using Shanon- Wiener diversity index (H) shows high species diversity of about 3.256 to 3.864, this clearly indicates that constant nectar flow with slight variation to

Apis dorsata population. Further these plants were grouped into 3 nectar yielders, 5 pollen yielders and 22 Nectar and pollen yielders (Fig. 1). Similarly, Hemalatha *et al.*, (2018) who also reported that 41 plants served as nectar yielders, 29 pollen yielders and 183 both nectar and pollen yielders as bee floral pasturage of *Apis ceranaindica*.

The honey flow period occurs during August to Mid- November and January to Mid-March and Honey Dearth period coincides between April to Mid- July which was found based on the abundance and frequency of bee visits in flowers and nectar flow, floral rewards of the plants (Fig. 2). Similarly, Bhalchandra *et al.*, (2014) stated that Mid – December to February and Mid-July to September were found as honey flow period and mid-April to mid - June were found as honey dearth period.

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