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Mapping of medicinal flora as honey bee forage

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Abstract

A study was made to prepare and observe mapping of existing medicinal flora as honey bee forage. The field activities were conducted between July 2014 and June 2015 in and around Chandigarh to observe the details of the diversity of bee flora. As many as twenty different medicinal plant species belonging to eleven tree species, three shrub species and six herb species under thirteen families were identified as potential honeybee forage plants during the course of the present study.

Keywords: Bee forage, Potential, Floral dearth period, Field activities, Mapping, Medicinal plants.

1. Introduction

Honeybee and plant have a special symbiotic association. The awareness to maintain the existing bee flora and multiplication of plant species is important for its sustainability. Plant types and their flowering duration differ from one place to another due to variation in geography and environmental conditions. The extensive understanding on type, density and value of bee flora are the significant factors for effective bee keeping. Each range has its own honey flow and floral dearth periods of short and long duration.

Honeybees are entirely depends upon flowering plants for their food requirements. Nectar is the sweet liquid comes from floral and extra floral resources; and is the raw material for honey while pollen is highly proteinaceous food for bees. The plants that yield both these substances are collectively referred as “bee pastures”^[1]. If the nectar yield is abundant from a good number of plants of a particular species is called “major honey flow period” on the hand collection of small amount of nectar is known as “minor honey flow period” while “dearth period” is no honey flow period^[2]. As nectar and pollen plants are basic requirements for beekeeping and honey production their knowledge is essential for beekeepers. Bee forage plants may be fruits, vegetables, ornamental plants, crops, medicinal plants, herbs, shrubs, bushes, trees, forest and weeds^[1, 6]. The knowledge of foraging behaviour of honeybees and their flora is essential for management of beekeeping^[3].

Bee forage calendar for beekeeping is a period that indicates the approximate date and the duration of the blossoming period of the existing honey or pollen plants in an area. In addition to the time and duration of blossoms of honey plants, it also involves the mapping of density, distribution, and honey potential of the regional bee flora. The bee forage calendar is one of the most useful tool in the sector of the apicultural operations which requires complete observation of the seasonal changes in the floral patterns of an area, the foraging behaviour of the bees, and the manner in which the honeybee colonies interact with their floral surroundings^[4].

Summer is the time for storage surplus food as there are more floras in the field and days are long for storing sufficient honey for the winter. April and May are usually considered to be the period of nectar flow. After honey flow, there comes the hot months of June and July when most of the colonies stop brood rearing in the lower hills and in the plains. December-January (winter season) and June-to-August (rainy season) were identified as the dearth period with low temperature flowering plants and some vegetables show flowering during rainy season^[2]. Because of continuous rain and thereby fluctuation in temperature this period also found unfavourable for honeybee foraging^[5]. It has been observed even during the course of studied period with reference to months of March and April. Chandigarh region is suitable for growing various multipurpose flora due to good degree of diversity in climatic conditions and temperature^[8]. There is diversity of flora in different seasons and honey bees visited these plants for pollen and nectar^[9].

Temperature and rainfall have a marked effect on honey bee activity. Colony strength is directly related to temperature at which bees forage. With rainfall bee foraging activities halts. It has been observed that the strong wind tends to reduce the ground speed of bees which resulted in reducing the number of flights per day.

2. Materials and Methods

The Union Territory of Chandigarh (30° 42' N, 76° 54' E, 280m MSL) [8], is located in the foothills of the Shivalik hill ranges in the north, which form a part of the fragile Himalayan ecosystem. It is occupied by Kandi (Bhabhar) in the north east and Sirowal (Tarai) and alluvial plains in the remaining part. The area is drained by two seasonal rivulets viz. Sukhna Choe in the east and Patiala-Ki-Rao Choe in the west. The central part forms a surface water divide and has two minor streams. The stream passing through the central part is called N-Choe and the other is Choe Nala.

The present study was carried out from July, 2014 to June 2015 thrice a week from 0630 to 1830 Hours in and around Chandigarh. The study included observation of bee's activities on flowers of different plant species. Whenever bees were found on the flowers of such plants, their foraging behaviour was observed for a period of 7-10 minutes. The plant has been scored as bee foraging species if at least three honeybees visited the flowers simultaneously within 6-8 minutes of the observation.

Extensive observations were documented with respect to types of relevant species visited and feeding on medicinal plants and specific co-relation with respect to bee forage. Observations were based basically on nectar source as well as activities performed by honey bees on different flowers of medicinal plants and these activities were recorded by using Sony camera 14.1 Mega Pixels and Nikon Camera with configuration of DX AF-S NIKKOR 18-55mm and Sony Xperia mobile Z1.

3. Results and Discussion

Based on the availability of different plants along with their flowering time, a bee floral mapping has been developed for Chandigarh region. This mapping is pertaining as per the month of flowering and distributed bee flora. The bee plants are available through-out the year, but January-April and July-August is major whereas April-May is minor flow period of pollen while June is dearth period [7, 10].

The availability of nectar from flora with medicinal importance are available at least for a period of two months while *Phyllanthus emblica* L, *Butea monosperma* (Lam), *Murraya koenigii* (L.), *Vitex negundo* L., *Justicia adhatoda* L and *Bauhinia variegata* L are available for a period of three months and *Ricinus communis* L and *Eucalyptus obliqua* L for a period of four and five months respectively (Figure 1).The detailed observations were made with respect to eleven tree species, six herb species and three shrub species of plants and constitute floral diversity to the extent of 55%, 30% and 15% respectively (Figure-2) in respect of the studied flora belonging to thirteen families were observed as potential nectariferous medicinal bee forage plants (Table-1) and (Plate 1-2).

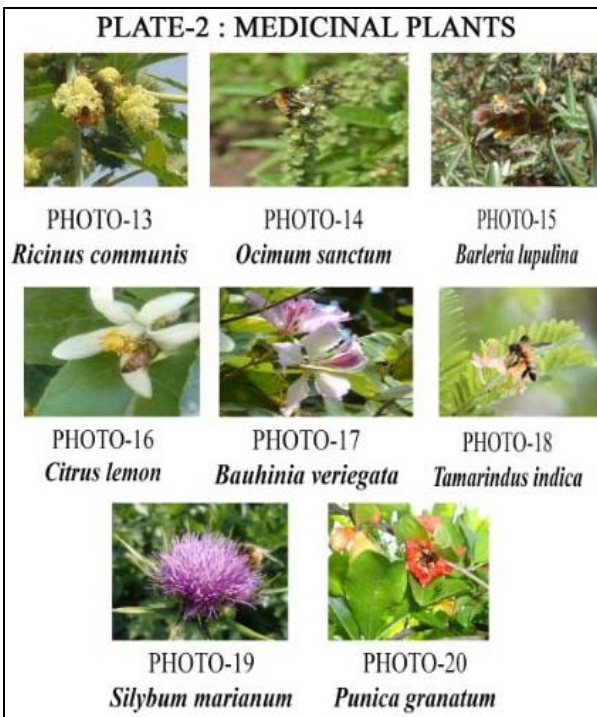


Table 1: Diversity of Nectariferous Medicinal Bee flora of Chandigarh

Sr No	Scientific name	Common Name	Family	Life form	Flowering period
1	<i>Azadirachta indica</i> (L.)	Neem	Meliaceae	Tree	April-May
2	<i>Phyllanthus emblica</i> L.	Amla	Phyllanthaceae	Tree	February-April
3	<i>Eucalyptus obliqua</i> L 'Heritier'	Safeda	Myrtaceae	Tree	November-March
4	<i>Eugenia jambolana</i> Lam.	Jamun	Myrtaceae	Tree	March-April
5	<i>Butea monosperma</i> (Lam.)	Flame of Forest	Fabaceae	Tree	February-April
6	<i>Saraca asoca</i> (Roxb.)	Sita Ashoka Tree	Fabaceae	Tree	March-April
7	<i>Woodfordia fruticosa</i> (L.)	Dhatiki	Lythraceae	Tree	April-May
8	<i>Asclepias tuberosa</i> (L.)	Butterfly milk	Apocynaceae	Herb	March-April
9	<i>Murraya koenigii</i> (L.)	Curry Patta	Rutaceae	Tree	March-May
10	<i>Vitex negundo</i> L.	Nirgundi	Lamiaceae	Shrub	February-April
11	<i>Justicia adhatoda</i> L.	Adhatoda	Acanthaceae	Shrub	February-April
12	<i>Ocimum tenuiflorum</i> L.	Shyam Tulsi	Lamiaceae	Herb	March-April
13	<i>Ricinus communis</i> L.	Castor oil Plant	Euphorbiaceae	Herb	February-May
14	<i>Ocimum sanctum</i> L.	Ram Tulsi	Lamiaceae	Herb	March-April
15	<i>Barleria lupulina</i> Lindl.	Kuranta	Acanthaceae	Herb	March-April
16	<i>Citrus lemon</i> L.	Neebu	Rutaceae	Shrub	February-May
17	<i>Bauhinia variegata</i> L.	Kachnar	Caesalpiniaceae	Tree	February-April
18	<i>Tamarindus indica</i> L.	Imli	Fabaceae	Tree	April-May
19	<i>Silybum marianum</i> (L)	Milk thistle	Asteraceae	Herb	February-March
20	<i>Punica granatum</i> L.	Annar	Lythraceae	Small Tree	March-April

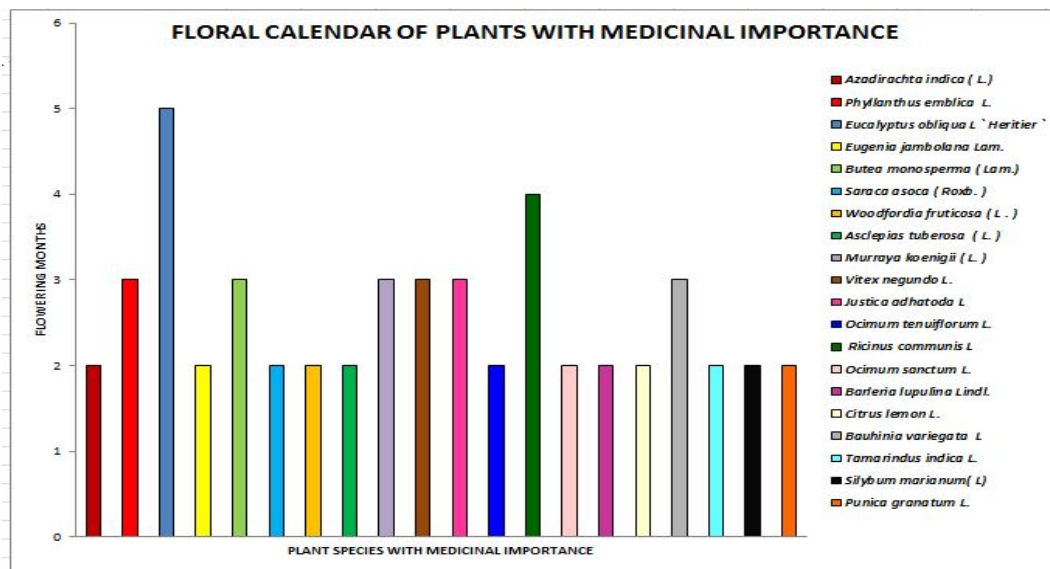


Fig 1: Flowering Months of Plants with Medicinal Importance

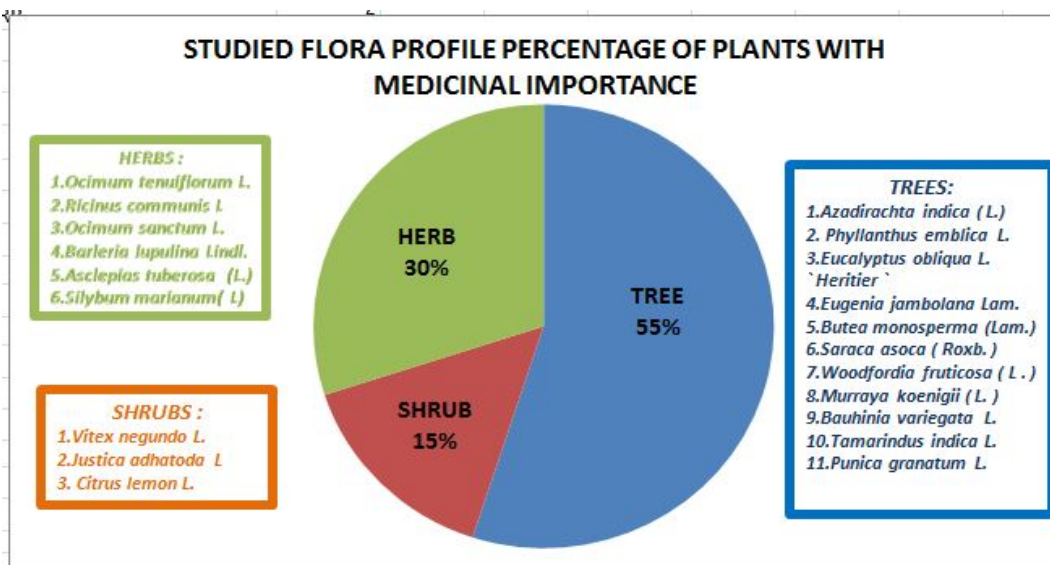


Fig 2: Floral Diversity of Studied Medicinal Plants

4. Conclusions

The present study finds out as many as 20 medicinal flora with excellent potential of honey bee forage in geographical location of Chandigarh region. The knowledge of medicinal bee flora of a Chandigarh region enable beekeepers to utilize them at the maximum level, so that they can harvest a good yield of honey and other bee products in addition to effective pollination, which enhances crop yields. Such knowledge on bee flora help in the effective management of bee colonies during such periods. To conserve these floras, attention must be given to maintain and multiply the existing flora. The present findings would be an insight in preparing an inventory of existing bee flora and develop floral calendar for Chandigarh region for future workers in the field of Apiculture operations.

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