



RESEARCH ARTICLE

BEE FLORA OF INDIAN BEE (*APIS CERANA INDICA*) IN SURGUJA REGION OF CHHATTISGARH

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Abstract: The availability of nectar and pollen for the consumption of bees are mandatory in apiculture. Floral Calendar of a locality guides the beekeepers of *Apis cerana indica* for efficient bee management to derive maximum benefit from beekeeping. In Surguja region 3 districts i.e., Surguja, Surajpur and Balrampur district, the present study was conducted at Surguja region during the year 2022 to 2023 and the result reveal that the 43 Honey bee floras i.e. Mustard, Sunflower, Pigeon pea, Maize, Field pea, Linseed, Hemelia, Tekoma, Bottle brush, Duranta, Onion, Tomato, Brinjal, Cucumber, Chilli, Sesame, Bitterguard, Okra, Merigol, Dehalia, Barseem, Mango, Guava, Papaya, Temrind, Lime, Moringa, Litchi and Ber, Purple nut sedge, Field bind weed, Black night shade, Wild snak gourd, Nilgiri, Arjun, Semal, Palas, Neem, Karanj, Sal, Dhawai, Red gulmohar and Yellow gulmohar were useful to honey bees in different month of calendar year and recognized as major honey bee forage sources. The bees are necessarily important component in cropping system by pollinating wide variety of crops. These groups were the provider of pollen, nectar and both pollen and nectar.

Keywords: Apiculture, *Apis cerana indica*, Bee flora, Floral calendar, Surguja region

INTRODUCTION

India is one of the leading mega biodiversity countries of the world to have more than 750 species of bee flora. It is estimated that majority of the floral resources of India is still under or unutilized. Pollination is a “free ecological service” honeybees play a vital role in agricultural and horticultural crop production ecosystems; because they provide pollination service to food crops and increase their productivity. (Pearce, 2014).

The four primary species of honey bee found in India. There are four types of honey bees: the European honey bee *Apis mellifera*, the Asian honey bee *Apis cerana indica*, the gigantic honey bee *Apis dorsata*, and the dwarf honey bee *Apis florea*. *Apis dorsata* and *Apis florea* live in the wild in uncovered hives, whereas *Apis mellifera* and *Apis cerana indica* are domesticated and can live in human-constructed hives. *Apis mellifera* and *Apis cerana indica* differ from one another in a few significant ways. In comparison to *Apis cerana indica*, *Apis mellifera* is a larger bee with larger colonies that can generate more honey. The *Apis cerana indica* hives are smaller because of variations in colony size. The utilization of these bees varies by region since *Apis mellifera* has historically been prone to illness and other problems because they help pollinate food

crops and boost their productivity, honeybees are essential to the agricultural and horticultural crop production ecosystems.

The existing bee flora in the country can very well support to 150-200 million colonies of bees but presently there are barely one million colonies tapping nectar from 0.5-0.7 per cent of the available bee floras. Bees depend solely upon the flowering plants to fulfill their dietary requirements and in turn render pollination of the plants. The plants that yield nectar and pollen are collectively referred as bee flora or bee pastures (Abrol, 1997).

Honey bees perform a special service by pollinating several plant species. But the performance of honey bees depends on the over-all health of the colony which directly depends on the availability of bee flora in a region (Pande and Ramkrushna 2018).

Beekeeping is crucial for farmers since it is an industry centered on agriculture, horticulture, and forestry. Beekeeping can be conducted to maximize supplementary income from other agricultural operations by investing a minimal amount of money. Beekeeping depends not only on a superior strain of honeybees but also on the availability and frequency of pollen and nectar sources in the vicinity of an apiary.

The honey-bee which is a social species live in big settlements of up to 100,000 individuals. An

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apiarist or beekeeper keeps bees for the collection of sweet honey and beeswax, or for pollination of crops. A bee garden is known as a beehive or "bee yard". Beekeeping means a scientific insect breeding process capable of producing honey and wax. Wax and other foreign materials are removed from honey for sweets production (Kumar and Sharma, 2014). Numerous plant floral members bloom throughout the year at various times. Depending on the season and the flowering of various plant species, foraging bees' access to pollen and nectar. Not all the honey flora involved in the primary honey flow at the same time, the bloom phase varies. Even the same nectar plant's blooming period can vary depending on the soil type, climatic conditions, and the vegetation habitat. The honey plants involved in the primary honey flow are not bound to any single place or region; rather, each of them has a highly specific range of climatic requirements. As a result, not all areas and regions of a country produce honey of the same type. A list of plants beneficial to honey bees were created after researching the blossoming times of certain significant honey plants in Poland.

According to the Indian government's survey, the large-scale beekeeping sector jobs are expected to produce three lakh man-working days through the establishment of 10000 colonies (Singh *et al.*, 2016).

MATERIALS AND METHODS

The study was conducted at Surguja, Surajpur and Balrampur districts of Northern Hills Zone of Chhattisgarh state during year 2022-2023. Total 63 beekeepers were incorporated as respondents for in-depth study. The data were collected through personal interview with the help of pre-tested interview schedule from all beekeepers. Information on bee flora, their flowering time and contribution per cent in every month were collected from respondents during the study period.

Formula

$$\text{Availability of bee flora per month} = \frac{\text{Number of bee flora species in a month}}{\text{Total number of bee flora}} \times 100$$

Each spots were observed for bee-floral plants including forests, ornamental plant, field crops and cropping sequence, vegetables and orchards and weeds present in the area, according to the availability of flowers the particular. Farmer's knowledge and status of bee keeping in the area surveyed were also assessed by asking simple questions as given below from the randomly selected respondent.

1. Name.....
2. Village.....
3. What is Honeybee....?
4. Different types of Honeybees.....
5. Types of bee hives they observed so far.
6. Domestication of Honeybees.....
7. Involved in Honey hunting practices

8. Knowledge about bee keeping....
9. Consumption of Honey (per day).....

Knowledge of beekeeping registered as poor (no knowledge, no training received), medium (not practicing but received training) and High (practicing bee keeping and training received), Honey hunting was assessed by percentage of respondents fetching honey from natural bee hives. General awareness was also assessed. Potentiality of the area for bee keeping was categorized as poor, medium and high, based on the data collected during the survey, *viz.*, bee-flora availability, presence of natural bee hives and knowledge about beekeeping. Floral calendar for pollen and nectar were prepared separately for the Surguja region as a whole by utilising the information collected on types of bee flora (nectar/pollen), density, time and duration of blooming of bee flora.

RESULTS AND DISCUSSION

A. Honey bee flora

Vegetation characteristics of the study areas are considered to be an important indicator for the potentialities of the area for beekeeping. Survey conducted in the study area showed that the cultivated and natural honey flora potential of the area makes it very favorable for beekeeping.

The data of be flora with respect to their common name, scientific name, habit and forage collected by bees were presented in Table 1 According to the beekeepers 43 plant species namely:-

1. 6 field crops bee flora *i.e.* Mustard, Sunflower, Pigeon pea, Maize, Field pea and Linseed.
2. 4 Ornamental plants *i.e.* Hemelia, Tekoma, Bottle brush and Duranta.
3. 8 Vegetable crops *i.e.* Onion, Tomato, Brinjal, Cucumber, Chilli, Sesame, Bitterguard and Okra.
4. 3 flowers plant *i.e.* Merigol, Dehalia and Barseem.
5. 8 fruits crop bee flora *i.e.* Mango, Guava, Papaya, Temrind, Lime, Moringa, Litchi and Ber.
6. 4 weeds bee flora *i.e.* Purple nut sedge, Field bind weed, Black night shade and Wild snak gourd.
7. 10 forest plant bee flora *i.e.* Nilgiri, Arjun, Semal, Palas, Neem, Karanj, Sal, Dhawai, Red gulmohar and Yellow gulmohar were recognized as major honeybee forage source.

Bee (*Apis cerena indica*) visited plants for its food, nectar and pollen. The vegetation type of honey bee flower species includes tree, shrubs, herbs and creepers. The identified honey bee flora produces both pollen and nectar.

In this research agreement with Jaiswal *et al.* (2018) observed that the bee-flora consists of mostly, fruits and agriculture crops like spices, pulses, cereals, oil seed/yielding, fiber, and fodder crops etc. These plants species served as the excellent sources of pollen and nectar in the study area. The result

revealed that 10 crops were useful to honeybees, out of which 5 crops were agricultural crops like as Mustard, pigeon pea, gram, bakla etc. and 4 horticulture crops like as mango, lemon, guava, anola and the forest plant like as eucalyptus, which are well distributed and commonly found in the study area. Ara *et al.* (2019) studied that annual herbs were found as potential source of pollen and nectar and grow as wild in this Himalayan region. A total of 37 species of bee were discovered, representing 15 genera, 6 families, and the reported flowering plants. The dominating group of bees was discovered to be the Apidae family.

B. Bee flora

Availability Table 2 depicts floral abundance round the year. Richness of plant species and colorful flower attracted the honey bee towards them. Among the diverse flora, horticulture crop were predominant nutritional resource. The highest floral abundance was recorded during the month of September, followed by March and July. August, October, November, February, April and June had moderate floral abundance. December, January and May were recorded with less floral abundance.

The results are close agreement with Painkra *et al.*

(2015) identified 68 foraging plants in Surguja district of Chhattisgarh. Singh *et al.* (2016) identified that the *Apis cerana* and stingless bees (*Tetragonula irridipennis*, *Tetragonula laviceps* and *Lophotrigona canifrons*) foraging plants, develop floral calendar, determine the honey flow and floral dearth period. The maximum bees' flora blooms during January to May and December whereas minimum bee's flora blooms during June to September. Therefore, honey flow period identified from January to May and June to September was identified as floral dearth period. Singh *et al.* (2023) studied the availability of nectar and pollen for the consumption of bees is mandatory in apiculture. Floral Calendar helps the beekeepers of *Apis cerana indica* for getting maximum benefit from beekeeping. Relevant information was gathered from beekeepers through pre-structured schedule 21 plant species in all, including mustard, sunflower, tomato, brinjal, mango, cucumber, chilli, guava, litchi, pigeon pea, ber, marigold, sesame, bitter gourd, sponge gourd, okra, and karanj, were identified as significant sources of honey bee foraging. According to a study, the area contains a wide variety of flora, thus there is a lot of promise for apiculture.



(1) Marigold



(2) Sunflower



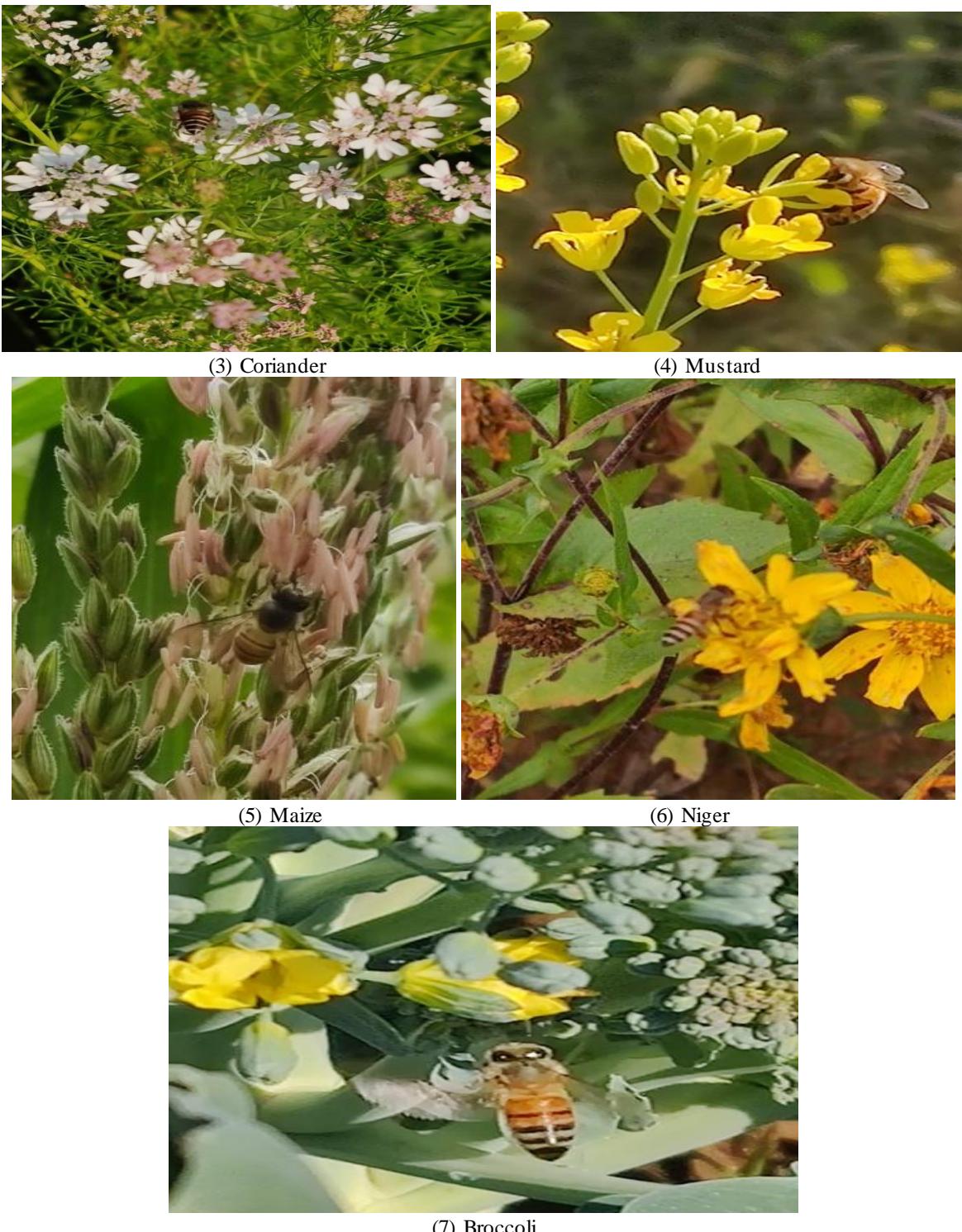


Fig. 1. Various bee flora were recorded in Surguja region of Chhattisgarh

Table 1. Major bee flora for Indian honey bee at Surguja region of Chhattisgarh during 2022 to 2023.

S.N.	Name of bee flora	Botanical name	Pollen+ Nectar availability in Surguja region of Chhattisgarh during the year 2022-23											Forage collection no. by honey bee	Total months	
			Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	July		
Field crops																
	Mustard	<i>Brassica juncea</i>					✓	✓	✓						N+P	03
	Sunflower	<i>Helianthus annuus</i>	✓	✓	✓				✓	✓	✓				N+P	06
	Pigeonpea	<i>Cajanus cajan</i>							✓	✓					N+P	02

	Maize	<i>Zea mays</i>	✓	✓			✓	✓				P	04	
	Field pea	<i>Pisum sativum</i>				✓	✓					N+P	02	
	Linseed	<i>Linum usitatissimum</i>				✓	✓					N+P	02	
Ornamental plants														
	Hamelia	<i>Hamelia patens</i>	✓	✓							✓	N+P	03	
	Tekoma	<i>Tecomia stans</i>	✓	✓							✓	✓	N+P	04
	Bottle brush	<i>Callistemon viminalis</i> <i>myrtales</i>	✓	✓						✓	✓	✓	N+P	05
	Duranta	<i>Duranta repens</i>							•	✓	✓	N	02	
Vegetable crops														
	Onion	<i>Alium cepa</i>						✓	✓			N+P	02	
	Tomato	<i>Lycopersican esculentum</i>				✓	✓					N	02	
	Brinjal	<i>Solanum melongena</i>	✓	✓	✓	✓					✓	N+P	05	
	Cucumber	<i>Cucumis sativus</i>	✓	✓								N+P	02	
	Chilli	<i>Capsicum frutescens</i>		✓	✓							N+P	02	
	Sesame	<i>Sesamum indicum</i>		✓	✓							N+P	02	
	Bitterguard	<i>Momordica charantia</i>		✓	✓	✓						N+P	03	
	Okra	<i>Abelmoschus esculentus</i>		✓	✓	✓			✓	✓		N+P	05	
Flowers														
	Marigold	<i>Tagetes erecta</i>		✓	✓	✓		✓	✓			P	05	
	Dahlia	<i>Dahlia pinnata</i>		✓	✓	✓					✓	✓	N	05
	Berseem	<i>Trifolium alexandrinum</i>							✓				N+P	01
Fruit crops														
	Mango	<i>Mangifera indica</i>					✓	✓	✓				N	03
	Guava	<i>Psidium guajava</i>			✓	✓		✓	✓		✓	✓	N+P	06
	Litchi	<i>Litchi chinensis</i>					✓	✓	✓	✓			N+P	04
	Ber	<i>Ziziphus mauritiana</i>	✓	✓								✓	N+P	03
	Papaya	<i>Carica papaya</i>	✓	✓			✓	✓			✓	✓	P	06
	Tamrind	<i>Tamarindus indica</i>	✓	✓							✓	✓	N+P	04
	Lime	<i>Citrus limon</i>			✓	✓		✓	✓		✓	✓	N+P	06
	Moringa	<i>Moringa oleifera</i>									✓		N+P	01
Weeds														
	Purple nut sedge	<i>Cyperus rotundus</i>				✓	✓	✓	✓	✓			N+P	06
	Field bind weed	<i>Convolvulus arvensis</i>	✓	✓	✓						✓	✓	N+P	06
	Black night shade	<i>Solanum nigrum</i>	✓	✓						✓	✓	✓	N+P	06
	Wild snak gourd	<i>Loccinia indica</i>	✓	✓	✓						✓	✓	N+P	05
Forest trees														
	Nilgiri	<i>Eucalyptus globules</i>				✓	✓						N+P	02
	Arjun	<i>Terminalia arjuna</i>			✓	✓	✓			✓	✓	✓	N+P	06
	Semal	<i>Bombax ceiba</i>						✓	✓				N+P	02
	Palas	<i>Butea monosperma</i>							✓	✓			N+P	02
	Karanj	<i>Millettia pinnata</i>						✓	✓	✓			N+P	03
	Neem	<i>Azadichta indica</i>						✓	✓	✓	✓		N+P	04

	Sal	<i>Shorea robusta</i>						✓	✓			N+P	02
	Dhawai	<i>Anogeissus latifolia</i>						✓	✓			N+P	02
	Red gulmohar	<i>Delonix regia</i>	✓					✓	✓	✓	✓	N+P	05
	Yellow gulmohar	<i>Peltophorum pterocarpum</i>	✓					✓	✓	✓	✓	N+P	05

Table 2. Bee flora availability in field crop, ornamental plant, vegetable, flower plants, fruit trees, weeds and forest trees during 2022 to 2023.

S.No.	Month	Total bee flora	Floral availability (%)						
			Field crops	Ornamental plants	Vegetable crops	Flower plants	Fruit trees	Weeds	Forest trees
1	August	14	7.13	21.43	14.29	00	21.43	21.43	14.29
2	September	19	10.52	15.79	31.57	10.52	15.79	15.79	00
3	October	14	14.29	00	25.71	14.29	14.29	14.29	7.14
4	November	11	00	00	36.36	18.18	18.18	9.09	18.18
5	December	08	25.00	00	12.50	00	25.00	12.50	25.00
6	January	07	42.85	00	00	00	42.85	14.28	00
7	February	14	35.71	00	00	7.14	28.57	7.14	21.43
8	March	16	18.75	00	12.50	6.25	25.00	6.25	31.25
9	April	14	7.14	00	14.28	7.14	00	14.28	57.14
10	May	10	00	10.00	00	00	20.00	20.00	50.00
11	June	14	00	21.42	00	7.14	28.57	21.42	21.42
12	July	15	00	26.66	6.66	6.66	26.66	20.00	13.33

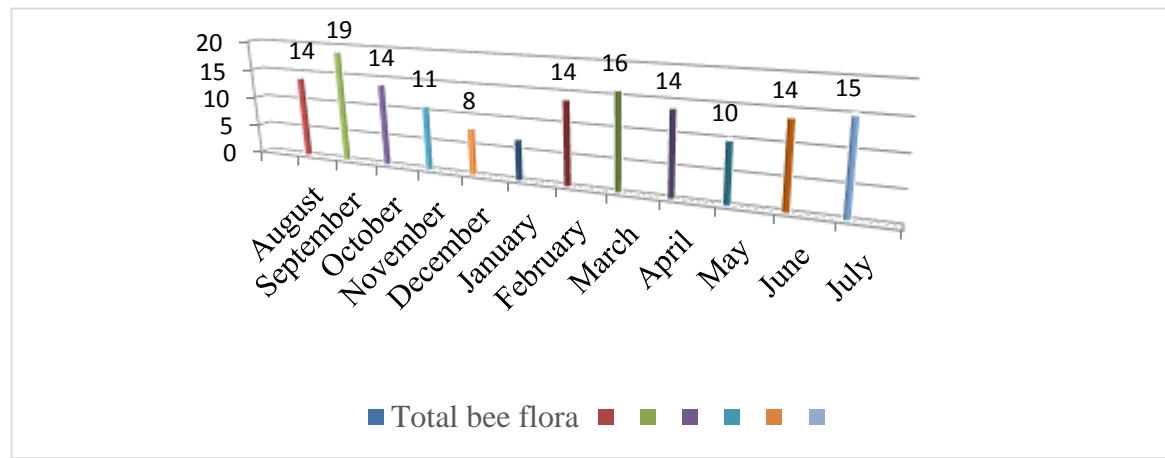


Fig. 3. Various bee flora was recorded in month wise at Surguja region of Chhattisgarh.

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