

# Studies on pollen and nectar yielding plants of honey bees at Pialitown, Dist. 24-Parganas, West Bengal, India

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Studies on pollen and nectar yielding plants were undertaken during 1995-96 at Pialitown, Dist. 24-Parganas (South), West Bengal to assess the utility of flowering plants to honey bees as major and minor sources of pollen and nectar. Total 64 plant species served as pollen and nectar yielding. Five major pollen and five major nectar yielding plants were identified viz. *Cocos nucifera*, *Borassus flabellifer*, *Phoenix sylvestris*, *Brassica* sp., *Citrus* sp., *Nephelium litchi*, *Terminalia* sp., *Nephelium longana*, *Syzygium* sp. and Cucurbitaceae family were the main sources in the area. Although bee forage was available throughout the year the highest number of useful bee plants were available in the month of April and lowest number of plants were available in the month of September. The best period for the honey collection was in March-April and May when blooming start in Litchi, Terminalia and Anshphal. Study reveals, that this region has good potential for the development of bee colonies.

**Key-words** - Bee forage, Honey bees, Pialitown, District 24-Parganas, West Bengal.

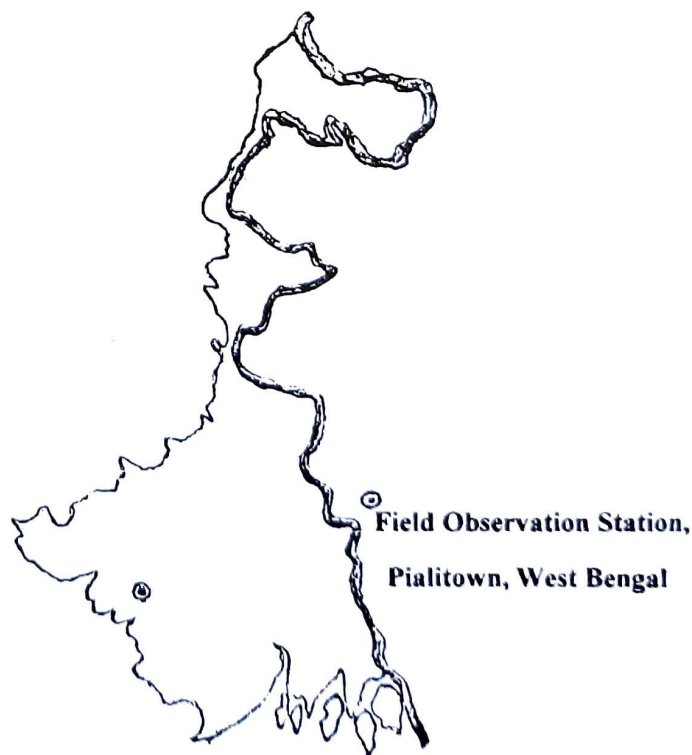
## INTRODUCTION

TO make successful any beekeeping programme in an area, it is essential to know the major and minor nectar and pollen yielding plants. Bees collect nectar from floral and extrafloral nectaries. It is a carbohydrate source; having sucrose, fructose and glucose in varying proportions. Pollen is the sole source of proteins. This plays a vital role in the growth and development of a bee colony.

Several studies using palynological methods have been made at the Central Bee Research and Training Institute, Pune to evaluate sources of pollen and nectar for honey bees in different parts of the country namely, Maharashtra (Thakar *et al.* 1962), Andhra Pradesh, (Singh *et al.* 1987); Bihar, (Suryanarayana and Singh 1989; Suryanarayana *et al.* 1992; Rakeshkumar & Choudhary, 1994), Assam (Rakeshkumar, 1993), Chaturvedi (1973, 1972) from Banthara, Uttar Pradesh; Ramanujam and Kalpana (1994) from Godavari district of Andhra Pradesh, etc. This study is therefore, aimed to recognize the major and minor pollen and nectar yielding plants to honey bees in Pialitown, District 24-Parganas, West Bengal. This region has good potential for beekeeping and its knowledge of floral wealth of the region is important for its maximum exploitation.

## MATERIAL AND METHODS

The investigations were carried out at the Field Observation Station (F.O.S.) of Central Bee Research and Training Institute (C.B.R.T.I.), Pialitown located in 24-Parganas (South) district of West Bengal (Lying between 21° 31' and 22° 57' N and 88° 2' and 89° 6' E) during 1995-96 (Fig.1).



**Fig. 1.** Map of location sites studied

Table 1. Floral Calendar of Paliatown, Dist. 24 Parganas, West Bengal, India.

Botanical Names/Taxon	Family	Local/vernacular name	Flowering period	Utility to bees
<i>Cocos nucifera</i> L.	Arecaceae	Narial	1-12	P3
<i>Musa paradisiaca</i> L.	Musaceae	Kela	1-12	N1
<i>Areca catechu</i> L.	Arecaceae	Supari	1-12	P1
<i>Cleome viscosa</i> L.	Cleomaceae	Halde hurhur,	12,1,2	P1
<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	Arhar	12, 1	P1, N1
<i>Brassica</i> sp.	Brassicaceae	Sarsha	12,1	P3,N2
<i>Moringa oleifera</i> Lamk	Moringaceae	Sajina	12,1	P1, N2
<i>Papaver rhoeas</i>	Papaveraceae	Potry	1	P1
<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	Khajur	1-2	P3
<i>Lathyrus sativus</i> L.	Fabaceae	Khesari	1-3, 10-12	P2,N2
<i>Capsicum annuum</i> L.	Solanaceae	Mircha	1,10	P1
<i>Raphanus sativus</i> L.	Brassicaceae	Mula	2	P1, N1
<i>Dalbergia sissoo</i> Roxb.	Fabaceae	Shisu	2	N1
<i>Ceiba pentandra</i> L.	Bombacaceae	Katesaver	2,3	P1
<i>Mangifera indica</i> L.	Anacardiaceae	Aam	2-3	N2,P,1
Asteraceae type	Asteraceae	--	2,4,11	P1,N1
<i>Leucas aspera</i> Spreng.	Lamiaceae	Swetdron	2,4, 11-12	N1
<i>Nephelium litchi</i> Camb.	Sapindaceae	Litchu	3	P1, N3
<i>Spondias dulcis</i> Soland	Anacardiaceae	Amrah	3	N2
<i>Nephelium longana</i> Camb.	Sapindaceae	Ansphal	3	N3
<i>Citrus decumna</i> L.	Rutaceae	Batabilebu	3	P3, N1
<i>Clerodendrum infortunatum</i> L.	Verbenaceae	Ghentu	3	N1
<i>Grewia asiatica</i> Mast	Tiliaceae	Phalsa	3	P1
<i>Coriandrum sativum</i> L.	Apiaceae	Dhone	3-4	P1,N2
<i>Psidium guajava</i> L.	Myrtaceae	Pearaa	3-4	P2,N2
<i>Bombax ceiba</i> L.	Bombacaceae	Simul	3-4	P1,N1
<i>Leonurus sibiricus</i> L.	Lamiaceae	Raktodron	3-4	N1
<i>Eugenia malaccensis</i>	Myrtaceae	Jamrul	3-4	P1,N1
<i>Momordica charantia</i> L.	Cucurbitaceae	Karola	3-7, 12	P1,N1
<i>Helianthus annuus</i> L.	Asteraceae	Sunflower	4	P1,N1
<i>Scoparia</i> sp.	Scrophulariaceae	-	4-5	P1
<i>Lagerstroemia flosreginae</i> L.	Lythraceae	Jarul	4-5	P1
<i>Delonix regia</i> (Boj) Rafin.	Caesalpiniaceae	Krishan churah	4-5	P1
<i>Sida</i> sp.	Malvaceae	Berela	4-5, 10-12	P1
<i>Luffa cylindrica</i> (L.) M.J. Roem	Cucurbitaceae	Dhundhul	4-6, 10-12	P1,N1
<i>Cucumis sativus</i> L.	Cucurbitaceae	Sossa	4-6	P1
<i>Cucurbita maxima</i> L.	Cucurbitaceae	Mitha kumrah	4-7	P2, N1
<i>Parthenium hysterophorus</i> L.	Asteraceae	Grass	4-8,12	P1
<i>Luffa acutangula</i> (L.) Roxb.	Cucurbitaceae	Ghinga	4-8	P1,N1
Amaryllidaceae types	Amaryllidaceae	--	5	P1

Botanical Names/Taxon	Family	Local/vernacular name	Flowering period	Utility to bees
<i>Terminalia arjuna</i> Wt.& Am.	Combretaceae	Arjun	5	P1,N2
<i>Syzygium jambosa</i> L. Alston	Myrtaceae	Kalojaam	5	P1,N2
<i>Amaranthus</i> sp.	Amaranthaceae	-	5	P1
<i>Tamarindus indica</i> L.	Caesalpiniaceae	Tentul	5-6	P1,N1
<i>Flacourtia</i> sp.	Flacourtiaceae	--	5-7	P1
<i>Olea europaea</i> L.	Oleaceae	Jalpai, Zaitun	6-7	P1
<i>Mimosa hamata</i> L.	Mimosaceae	Lajjbanti	6-8, 10	P1,N1
<i>Acacia</i> sp.	Mimosaceae	Kikar	7	P1
<i>Dillenia indica</i> L.	Dilleniaceae	Chatta	7	P1,N1
Rubiaceae type	Rubiaceae	--	7	P1
<i>Glycosmis pentaphylla</i> Retz.	Rubiaceae	Asheorah	7-8	N1
<i>Anthocephalus cadamba</i> (Roxb.) Miq	Rubiaceae	Kadam	7-8	N1
Moraceae type	Moraceae	-	8	P1
<i>Angelonia grandiflora</i> L.	Scrophulariaceae	-	8	P1
<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Kul	9-10	P1,N2
<i>Cyanotis</i> sp.	Commelinaceae	-	9-11	P1
<i>Peltophorum pterocarpum</i> L.	Caesalpiniaceae	-	10	P1
<i>Eucalyptus</i> sp.	Myrtaceae	Eucalyptus	10-12	P2,N1
Solanaceae type	Solanaceae	--	11	P1
<i>Vernonia</i> sp.	Asteraceae	Bansiuli	11,1	P1,N2
<i>Dolichos lablab</i> L.	Fabaceae	Seem	11,1	P1,N1
<i>Tagetes erecta</i> L.	Asteraceae	Ganda	11,12,1	P1,N1
<i>Vicia faba</i> L.	Fabaceae	Bakal	11,12,1,2	N1
<i>Borassus flabellifer</i> L.	Arecaceae	Taal	11,12,4-5	P3

1-January, 2-February, 3-March, 4-April, 5-May, 6-June, 7-July, 8-August, 9-September, 10- October, 11-November, 12-December  
N-Nectar, P-Pollen, 3-Major, 2- Medium, 1-Minor  
Relative importance as assessed visually and palynologically.

The F.O.S. was established by the Institute in 1993 for investigations on various aspects of apicultural research. At this centre both *Apis mellifera* L. and *Apis cerana* Fab. bee colonies were maintained. To-

tal 1366 samples of pollen loads were collected from incoming honey bees into the hive at an interval of 2 hours throughout the period and each of these was examined microscopically to identify the plant species

Table 2. Analysis and Frequency of occurrence ( %) of pollen loads.

Number of loads	Major pollen sources (Major pollen types)	Number of loads	Medium pollen sources (Medium pollen types)
555	<i>Cocos nucifera</i> (40.6%)	36	<i>Cucurbita</i> sp. (2.6%)
118	<i>Borassus flabellifer</i> (8.6%)	33	<i>Psidium guajava</i> (2.4%)
80	<i>Citrus</i> sp. (5.9%)	25	<i>Syzygium cumini</i> (1.8%)
66	<i>Brassica</i> sp. (4.8%)	38	Fabaceae (2.8%)
62	<i>Phoenix sylvestris</i> (4.5%)	44	Poaceae (3.2%)
Total 881 (64.5%)		22	<i>Lathyrus sativus</i> (1.6%)
		22	<i>Cyanotis</i> sp. (1.6%)
		Total 220 (16.1%)	

**Table 3 : Analysis and Frequency of Occurrence (%) of pollen loads.**

Number of loads	Minor pollen sources (Minor pollen types)	Percentage
15	<i>Grewia sp.</i>	(1.0%)
19	<i>Delonix regia</i>	(1.4%)
7	<i>Sida sp.</i>	(0.5%)
1	<i>Azadirachta indica</i>	(0.07%)
10	<i>Asteraceae</i>	(0.7%)
8	<i>Mimosa hamata</i>	(0.6%)
6	<i>Tamarindus indica</i>	(0.4%)
12	<i>Flacourtia sp.</i>	(0.9%)
14	<i>Cucurbita pepo</i>	(1.0%)
18	<i>Luffa sp.</i>	(1.3%)
13	<i>Angelonia grandiflora</i>	(0.9%)
16	<i>Coriandrum sativum</i>	(1.2%)
6	<i>Nephelium litchi</i>	(0.4%)
7	<i>Bombax ceiba</i>	(0.5%)
8	<i>Ceiba pentandra</i>	(0.6%)
1	<i>Mangifera indica</i>	(0.07%)
6	<i>Syzygium sp.</i>	(0.4%)
19	<i>Parthenium hysterophorus</i>	(1.4%)
9	<i>Eucalyptus sp.</i>	(0.7%)
15	<i>Capsicum annum</i>	(1.%)
6	<i>Caesalpinaceae</i>	(0.4%)
3	<i>Momordica charanita</i>	(0.2%)
17	<i>Cucumis sativus</i>	(1.2%)
9	<i>Peltophorum pterocarpum</i>	(0.7%)
1	<i>Solanaceae</i>	(0.07%)
3	<i>Helianthus annuus</i>	(0.2%)
3	<i>Vernonia sp.</i>	(0.2%)
1	<i>Moringa oleifera</i>	(0.07%)
3	<i>Acacia sp.</i>	(0.2%)
1	<i>Amaranthus sp.</i>	(0.07%)
2	<i>Cleome sp.</i>	(0.1%)
3	<i>Rubiaceae</i>	(0.2%)
1	<i>Amarylidaceae</i>	(0.07%)
2	<i>Moraceae</i>	(0.1%)

Relative importance to honey bees

Pollen loads	1-20	Minor pollen source
Pollen loads	20-25	Medium pollen source
Pollen loads	>50	Major pollen source

to which the pollen grains belonged following Erdtman (1952) methods. Depending on their numbers, plants were grouped as relative importance to honey bees

following Suryanarayana *et al.* (1992) method. Visual observations on plant specimens within (2km) radius of apiary were also recorded during foraging trips of honey bees on the flowers.

## RESULTS AND DISCUSSION

The plants useful to the honeybees in Paliatow, district 24-Parganas (West Bengal) along with their flowering period, utility to honeybees, local or common name, etc. are listed in table. 1.

The results revealed that a total number of 64 plant species served as pollen and nectar sources to honey bees in the locality.

The details of the microscopical analysis of pollen loads are given in Table 2 and 3. Analysis revealed that of the 1366 pollen loads studied. Of these, five major pollen yielding plant species were identified, viz. *Cocos nucifera* (40.6%), *Borassus flabellifer* (8.6%), *Citrus sp.* (5.9%), *Brassica sp.* (4.8%) and *Phoenix sylvestris* (4.5%).

*Cocos nucifera* is the most important pollen source for whole of the period studies with 40.6% of the total loads coming from it and provided major quantity of forage to the honey bees throughout the period. Next in the order of the importance sources of pollen were *Cucurbita sp.*, *Psidium guajava*, *Syzygium cumini*, *Fabaceae*, *Poaceae*, *Lathyrus sativus* and *Cyanotis sp.* contributed 16.1% of the total loads (Table. 2). Among the minor pollen sources, 34 plant species contributing to nearly 19.4% of the total loads. (Table 3).

The results revealed that the area is having following annual horticultural crops such as *Citrus sp.*, *Mangifera indica*, *Psidium guajava*, *Grewia asiatica*, *Cocos nucifera*, *Musa paradisiaca*, *Nephelium litchi*, *Ziziphus mauritiana*, which provides forage to honey bees.

Agricultural crops such as *Cucurbita sp.*, *Cucurbita pepo.*, *Cucumis sativus*, *Momordica charantia*, *Vicia faba*, *Dolichos lablab*, *Cucurbita maxima*, *Luffa acutangula*, *Luffa cylindrica* for their fruits; *Coriandraum sativum* and *Cajanus cajan* for their seed/ leaf; *Helianthus annus* and *Brassica sp.* for oil seeds; *Lathyrus sativus* for fod-

**Table 4 :** Monthwise distribution of pollen, nectar and both yielding plants in Pialitown, Dist. 24-Parganas, West Bengal, India.

Months	*Distribution of sources		
	Pollen (P)	Nectar (N)	N+P
January	6	2	7
February	5	4	4
March	4	5	10
April	9	3	10
May	12	1	7
June	6	1	6
July	7	3	5
August	5	3	2
September	3	1	1
October	5	1	5
November	6	3	7
December	6	3	8
Total	P=74	N=30	NP=65

\* Based on their flowering periods, same plant species were counted again in another months also

der. All these crops contribute seasonal forage to honey bees.

The arboreal sources cultivated/wild in the Pialitown are *Moringa oleifera*, *Borassus flabellifer*, *Syzygium cumini*, *Delonix regia*, *Azadirachta indica*, *Tamarindus indica*, *Areca catechu*, *Anegeion grandiflora*, *Dalbergia sissoo*, *Ceiba pentandra*, *Bombax ceiba*, *Terminalia* sp., *Peltophorum pterocarpum*, *Eucalyptus* sp., *Phoenix sylvestris*, etc. provided pollen and nectar to honey bees. Among the weeds, *Cyanotis* sp. was found important to bees. *Parthenium hysterophorus*, *Vernonia* sp. and *Amaranthus* sp. also provided forage to bees.

In this region, *Nephelium litchi*, *Terminalia* sp., *Nephelium longana*, *Syzygium jambosa*, *Spondias dulcis*, were the main nectar sources and provided good quantity of nectar to honey bees.

Although bee forage was available throughout the year in the locality the highest number of useful bee plants were available in the month of April and lowest

number of plants were available in the month of September. The monthwise distribution of pollen/nectar and both yielding plants were presented in Table 4. Based on the flowering period, same plant species were counted again in more than one month.

Studies revealed that region has good potential for the development of bee colonies which can produce honey from March to April/May, and again from October to January.

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