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 Pialitown, Dis | t. 24 Parganas, | West | Bengal, | India |
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| Luffa cylindrica (L.) M.J. RoemCucurbitaceaeDhundhul4-6, 10-12P1,N1Cucumis sativus L.CucurbitaceaeSossa4-6P1Cucurbita maxima L.CucurbitaceaeMitha kumrah4-7P2, N1Parthenium hysterophorus L.AsteraceeaeGrass4-8, 12P1Luffa acutangula (L.) Roxb.CucurbitaceaeGhinga4-8P1,N1 | Sida sp. | Malvaceae | Berela | 4-5 10-12 | Pl | |
| Cucumis sativus L.CucurbitaceaeSossa4-6P1Cucurbita maxima L.CucurbitaceaeMitha kumrah4-7P2, N1Parthenium hysterophorus L.AsteraceeaeGrass4-8, 12P1Luffa acutangula (L.) Roxb.CucurbitaceaeGhinga4-8P1,N1Amaryllidaceae typesAmaryllidaceae571 | Luffa cylindrica (L.) M.J. Roem | Cucurbitaceae | Dhundhul | 4-6 10-12 | | |
| Cucurbita maxima L.CucurbitaceaeMitha kumrah4-7P1Parthenium hysterophorus L.AsteraceeaeGrass4-8,12P1Luffa acutangula (L.) Roxb.CucurbitaceaeGhinga4-8P1,N1Amaryllidaceae typesAmaryllidaceae574 | Cucumis sativus L. | Cucurbitaceae | Sossa | 4-6 | | |
| Parthenium hysterophorus L. Asteraceeae Grass 4-7 P2, N1 Luffa acutangula (L.) Roxb. Cucurbitaceae Ghinga 4-8, 12 P1 Amaryllidaceae types Amaryllidaceae 5 71 | Cucurbita maxima L. | Cucurbitaceae | Mitha kumrah | 4-7 | | |
| Luffa acutangula (L.) Roxb. Cucurbitaceae Ghinga 4-8. P1.N1 Amaryllidaceae types Amaryllidaceae 5. 5. 5. | Parthenium hysterophorus L. | Asteraceeae | Grass | 4-8-12 | r2, N1 | |
| Amaryllidaceae types Amaryllidaceae | Luffa acutangula (L.) Roxb. | Cucurbitaceae | Ghinga | 4-0,12 | PI DI NU | |
| | Amaryllidaceae types | Amaryllidaceae | | 5 | PLNL | |

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

| Number of loads | Major pollen sources (Major pollen types) | Number of loads | Medium pollen sources (Medium pollen types) |
|-------------------|--|-------------------|--|
| 555 | Cocos nucifera (40.6%) | 36 | <i>Cucurbita</i> sp. (2.6%0 |
| 118 | Borassus flabellifer (8.6%) | 33 | Psidium guajava (2.4%) |
| 80 | Citrus sp.(5.9%) | 25 | Syzygium cumini (1.8%) |
| 66 | Brassica sp. (4.8%) | 38 | Fabaceae (2.8%) |
| 62 | Phoenix sylvestris (4.5%) | 44 | Poaceae (3.2%) |
| Total 881 (64.5%) | | 22 | Lathyrus sativus (1.6%) |
| | | 22 | Cyanotis sp. (1.6%) |
| | | Total 220 (16.1%) | |

| Number of | Minor pollen sources (Minor | Percentage |
|-----------|-----------------------------|------------|
| loads | pollen types) | (1.07) |
| 15 | Grewia sp. | (1.0%) |
| 19 | Delonix regia | (1.4%) |
| 7 | Sida sp. | (0.5%) |
| 1 | Azadirachta indica | (0.07%) |
| 10 | Asteraceae | (0.7%) |
| 8 | Mimosa hamata | (0.6%) |
| 6 | Tamarindus indica | (0.4%) |
| 12 | Flacourtia sp. | (0.9%) |
| 14 | Cucurbita pepo | (1.0%) |
| 18 | Luffa sp. | (1.3%) |
| 13 | Angelonia grandiflora | (0.9%) |
| 16 | Coriandrum sativum | (1.2%) |
| 6 | Nephelium litchi | (0.4%) |
| 7 | Bombax ceiba | (0.5%) |
| 8 | Ceiba pentandra | (0.6%) |
| 1 | Mangifera indica | (0.07%) |
| 6 | Syzygium sp. | (0.4%) |
| 19 | Parthenium hysterophorus | (1.4%) |
| 9 | Eucalyptus sp. | (0.7%) |
| 15 | Capsicum annuum | (1.%) |
| 6 | Caesalpiniaceae | (0.4%) |
| 3 | Momordica charanita | (0.2%) |
| 17 | Cucumis sativus | (1.2%) |
| 9 | Peltophorum pterocarpum | (0.7%) |
| 1 | Solanaceae | (0.07%) |
| 3 | Helianthus annuus | (0.2%) |
| 3 | Vernonia sp. | (0.2%) |
| 1 | Moringa oleifera | (0.07%) |
| 3 | Acacia sp. | (0.2%) |
| 1 | Amaranthus sp. | (0.07%) |
| 2 | Cleome sp. | (0.1%) |
| 3 | Rubiaceae | (0.2%) |
| 1 | Amaryllidaceae | (0.07%) |
| 2 | Moraceae | (0.1%) |

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

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 Pialitown, distirict 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 fodTable 4 : Monthwise distribution of pollen, nectar and bothyielding 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 | |
| Мау | 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, Anegelonia 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 qantity 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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