Pollen source for apiaries during honey flow period in Krishna district, Andhra Pradesh

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Kalpana, T.P. & Ramanujam, G.G.K.1996. Pollen source for apiaries during honey flow period in Krishna district, Andhra Pradesh. *Geophytology* 25: 125-129.

Pollen analyses of 1000 comb pollen loads of *Apis cerana* var. *indica* collected from the agricultural tracts of Pamidimukkala and Movva mandals in Krishna district, A.P. during the months of March and April, 1994 and 1995 were carried out.

The pollen loads were either found to be unifloral (924). bifloral (73) or multifloral (3). Out of 9 pollen types recorded, *Borassus flabellifer* serves as the major pollen source where as *Cocos nucifera, Syzygium cumini, Alangium salvifolium, Leucaena leucocephala, Feronia elephantum , Phyllanthus emblica, Albizia lebbek* and *Cucumis sativus* represent minor sources of pollen.

Key-Words- Pollen loads, honey bees, honey flow period, Krishna district, Andhra Pradesh.

INTRODUCTION

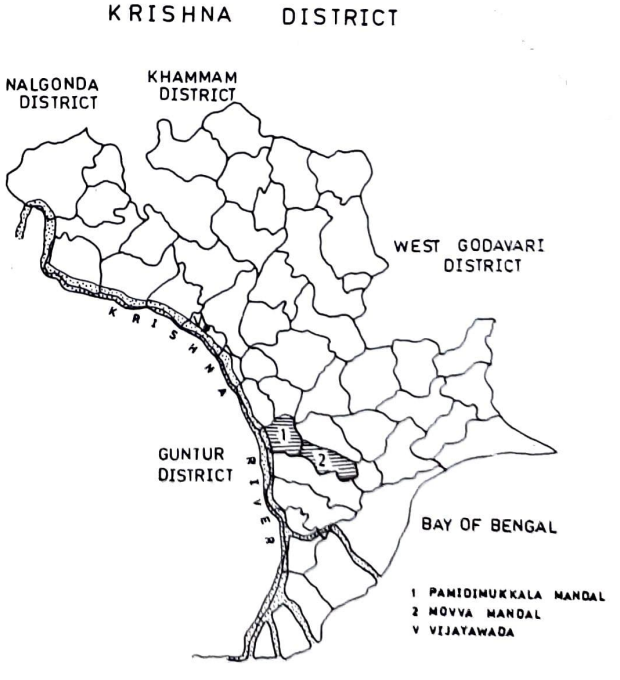
ONGOING melittopalynological studies of the apiary honeys of Krishna district indicate that the period March to mid-May represents the major honey flow season, facilitating commercial harvesting of honey. *Borassus flabellifer* L. found abundantly and ubiquitously in this district provides the major source of nectar for the honey production.

Published information on the major pollen sources for the Indian hive bees in Andhra pradesh is woefully meagre. Singh *et al.* (1987) studied bee pollen loads at Vijayarai in the West Godavari district and recognized *Cocos nucifera, Cucumis sativus, Citrullus lanatus* and *Citrus* sp. as important pollen sources. Ramanujam and Kalpana (1994) from a study of the pollen stores of some apiary colonies in East Godavari district brought to light *Borassus flabellifer* and *Cocos nucifera* as major sources of pollen in this district.

The present study is aimed at identifying the chief pollen source for the honey bees *Apis cerana* F. during the honey flow season in Krishna district based upon the analysis of numerous pollen loads from the pollen stores of the brood frames of the bee hives.

MATERIAL AND METHODS

1000 comb pollen loads of *Apis cerana* var. *indica* were procured during the months of March and April, 1994 and 1995 from the agricultural tracts of Pamidimukkala and Barlapudi villages of Pamidimuk-



Map 1. Showing locaiton of Apiary Colonies

Table 1. Analysis of comb pollen loads

Unifloral		Bifloral		Multifloral	
No.	Composition	No.	Composition	No.	Composition
866	*Borassus flabellifer*	21	*Borassus flabellifer* & *Alangium salvifolium*	2	*Borassus flabellifer*,*Cocos nucifera* & *Syzygium cumini*
23	*Cocos nucifera*	20	*Borassus flabellifer* & *Syzygium cumini*	1	*Borassus flabellifer*, *Leucaena leucocephala* & *Alangium salvifolium*
18	*Leucaena leucocephala*	10	*Borassus flabellifer* & *Cocos nucifera*		
7	*Fero..ia elephantum*	7	*Borassus flabellifer* & *Feronia elephantum*		
4	*Syzygium cumini*	5	*Borassus flabellifer* & *Phyllanthus emblica*		
3	*Alangium salvifolium*	2	*Cocos nucifera* & *Syzygim cumini*		
2	*Phyllanthus emblica*	2	*Cocos nucifera* & *Albizia lebbek*		
1	*Albizia lebbek*	2	*Leucaena leucocephala* & *Alangium salvifolium*		
		1	*Borassus flabellifer* & *Leucaena leucocephala*		
		1	*Cocos nucifera* & *Leucaena leucocephala*		
		1	*Cocos nucifera* & *Phyllanthus emblica*		
		1	*Cocos nucifera* & *Cucumis sativus*		
Total					
924 (92.4%)		73 (7.3%)		3 (0.3%)	

kala and Movva mandals, respectively in Krishna District, Andhra Pradesh (Map 1). The pollen loads were collected from the pollen stores seen in the brood frames of four different hives maintained at two private apiaries.

The pollen loads in the hive pollen stores seen stacked neatly one above the other in discrete discs in a superimposed fashion, were scooped out carefully with arrow head needles and kept on a clean white paper and allowed to air dry for a few minutes. Afterwards a gentle tap with a needle facilitated separation of the individual loads. Each load was then stored in a paper packet and the date of collection was noted. Small amounts of pollen from different parts of each load were transferred to a slide and a temporary mount was made for preliminary microscopic study of the pollen contents. The loads were then subjected to acetolysis (Erdtman, 1960) for permanent slide preparation and the identification of the pollen types was done with the help of reference slides. The comb pollen loads were designated either as unifloral (with 90% of a single pollen type in a count of 500 grains), bifloral (with two pollen types) and multifloral (with three or more pollen types). The bi-and multifloral loads may also be designated as mixed loads. The pollen productivity was computed using haemocytometer.

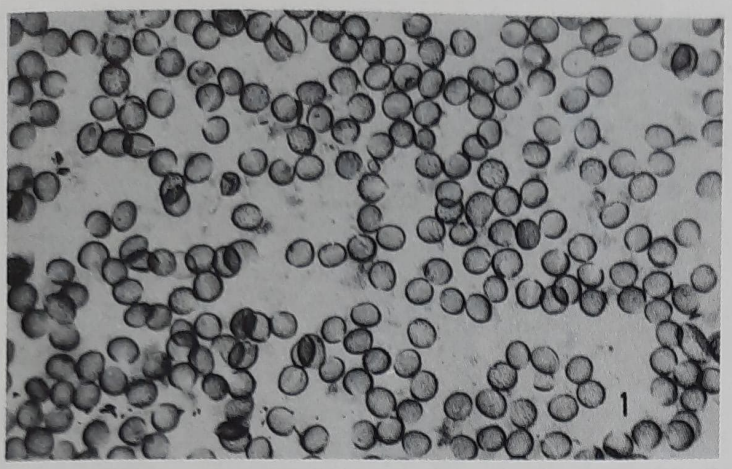
OBSERVATIONS

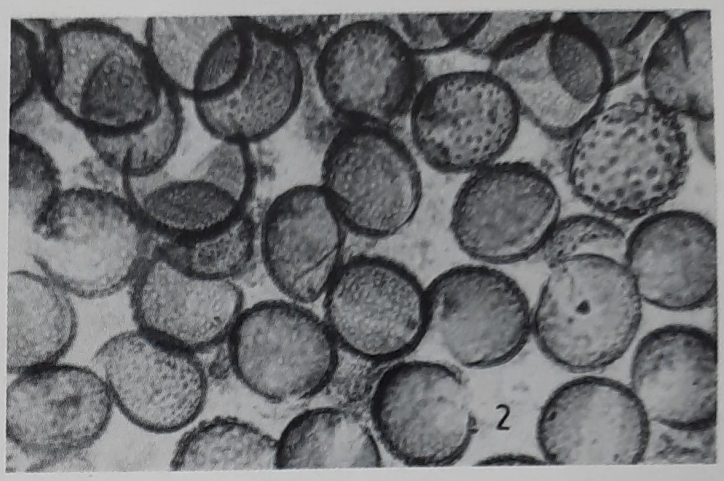
Of the 1000 pollen loads examined, as many as 924 (92.4%) were found to be unifloral, 73 (7.3%) bifloral and 4 (0.3%) multifloral. The overwhelming majority of the unifloral loads i.e., 866 (93.72%) were of *Borassus flabellifer*. Pollen types recorded in the other unifloral loads were of Cocos nucifera (23 loads), *Leucaena leucocephala* (18), *Feronia elephantum* (7), *Syzygium cumini* (4), *Alangium salvifolium* (3), *Phyllanthus emblica* (2) and *Albizia lebbek* (1).

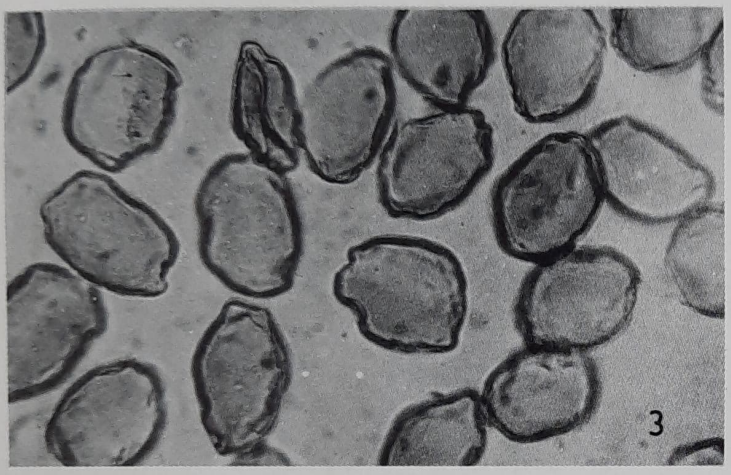
Plate 1 →

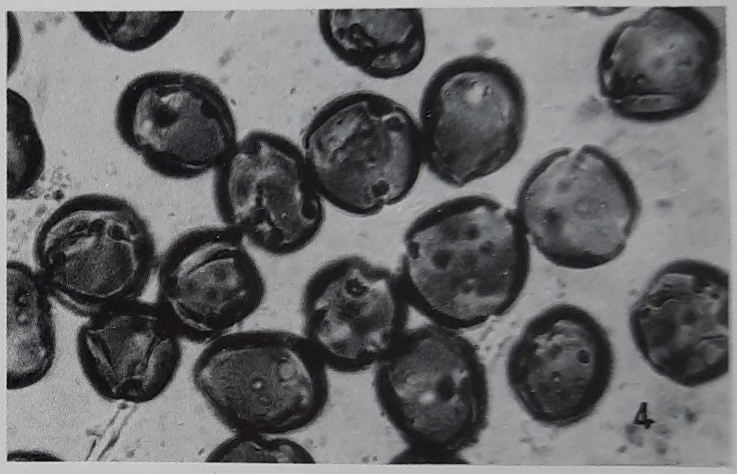
(Unless otherwise mentioned all figs x 300):

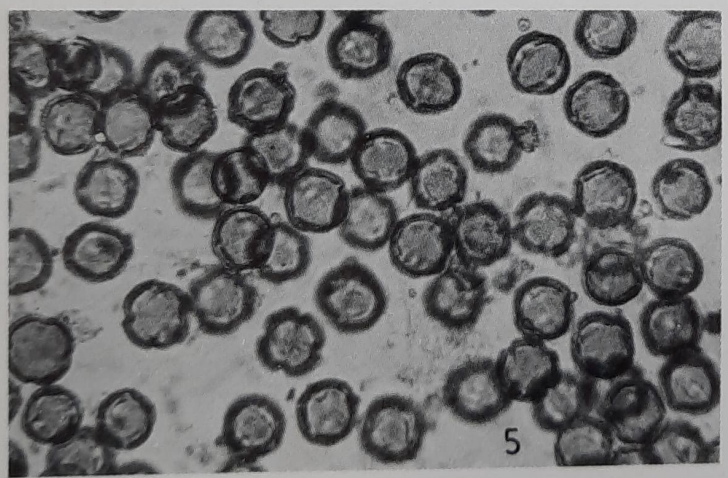
1-7. Pollen types recorded in the unifloral pollen loads.
1. *Borassus flabellifer* x 60
2. *B. flabellifer* x 200
3. *Cocos nucifera*
4. *Leucaena leucocephala*
5. *Feronia elephantum*
6. *Syzygium cumini*
7. *Alangium salvifolium*
8. *Borassus flabellifer* and *Feronia elephantum* in the bifloral pollen load.

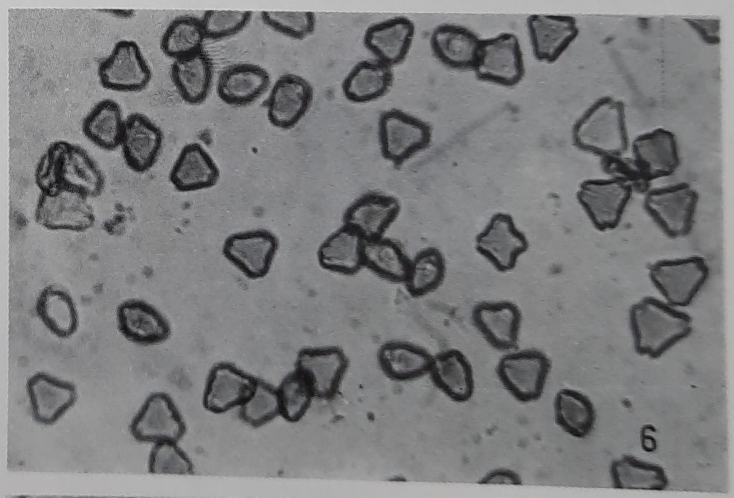


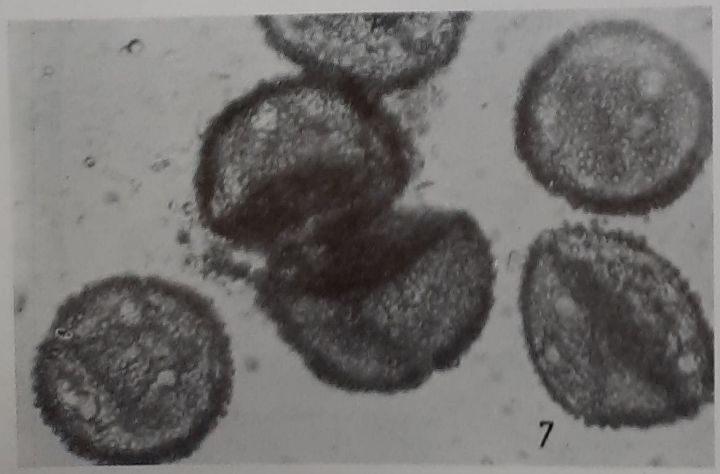












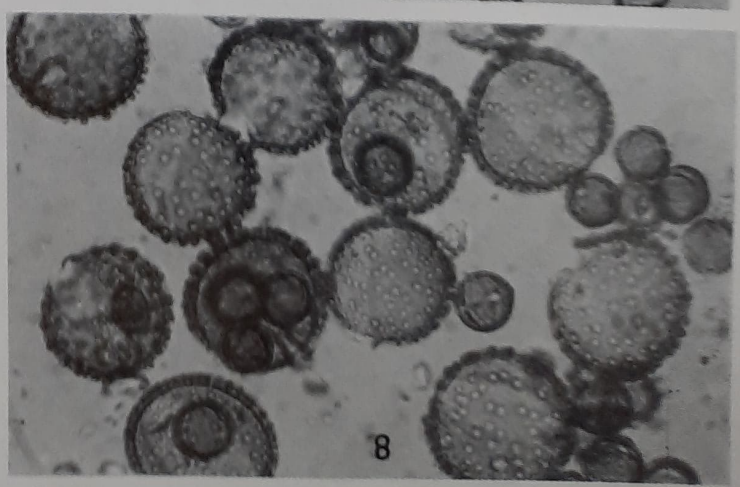


Plate 1

Table 2. Frequency of occurrence (%) of pollen in the overall pollen loads

Pollen type	No.of Unifloral loads	No.of Bifloral loads	No.of Multifloral loads	Total loads	Percentage
Alangium	3	23	1	27	2.7
Albizia	1	2	-	3	0.3
Borassus	866	64	3	933	93.3
Cocos	23	17	2	42	4.2
Cucumis	-	1	-	1	0.1
Feronia	7	7	-	14	1.4
Leucaena	18	4	1	23	2.3
Phyllanthus	2	6	-	8	0.8
Syzygium	4	22	2	28	2.8

Borassus flabellifer, *Alangium salvifolium*, *Syzygium cumini*, *Cocos nucifera*, *Feronia elephantum*, *Phyllanthus emblica*, *Albizia lebbek*, *Leucaena leucocephala* and *Cucumis sativus* were encountered in the bifloral loads in various combinations. The pollen of *Borassus* was noted in the majority of the bifloral loads (64) followed by *Alangium* (23), *Syzygium* (22) and *Cocos* (17).

Of the 3 multifloral loads, 2 had the pollen of *Borassus flabellifer*, *Cocos nucifera* and *Syzygium cumini* and 1 those of *Borassus flabellifer*, *Leucaena leucocephala* and *Alangium salvifolium*.

Information on the various types of uni-, bi- and multifloral loads recorded in the study is provided in Table 1. Table 2 shows the frequency of occurrence of pollen types in the overall pollen loads examined. *Borassus flabellifer* with a frequency representation of 93.3 % is the most frequently encountered pollen type.

All such pollen types recorded in > 50 % of the pollen loads were designated as major pollen sources (P1), 10-50% medium pollen sources (P2) and < 10% minor pollen sources (P3). Accordingly, *Borassus flabellifer* encountered in 93.3% of the total pollen loads is referable to the category P1 and serves as the major pollen source. *Cocos nucifera*, *Syzygium cumini*, *Alangium salvifolium*, *Leucaena leucocephala*, *Feronia elephantum*, *Phyllanthus emblica*, *Albizia lebbek* and *Cucumis sativus*, encountered in < 10% of the loads are referable to the category P3 (Table 3), and constitute only minor pollen sources in the area studied.

Table 3. Pollen sources for the honey bees during the honey flow period

Taxon	Family	Flowering period	pollen forage value
Alangium salvifolium (L.f.) Wanger.	Alangiaceae	March-May	P_3
Albizia lebbek (L.) Benth.	Mimosoideae	March-June	P_3
Borassus flabellifer L.	Arecaceae	Throughout the year, peak: March-April	P_1
Cocos nucifera L.	Arecaceae	Throughout the year	P_3
Cucumis sativus L.	Cucurbitaceae	March-October	P_3
Feronia elephantum Correa.	Rutaceae	Feb.-March	P_3
Leucaena leucocephala (Lam.) de Wit.	Mimosoideae	April-August	P_3
Phyllanthus emblica L.	Euphorbiaceae	March-May	P_3
Syzygium cumini (L.) Skeels.	Myrtaceae	March-May	P_3

P_1: Major pollen source; P_3: Minor pollen source

The unifloral pollen loads were found to be of various shades of yellow and brown viz., bright yellow (*Borassus*), pale yellow or cream colour (*Cocos*), yellowish brown (*Leucaena, Alangium*), light brown (*Syzygium*) and yellow (*Phyllanthuys,Albizia, Feronia*). Plate 1 (figs 1-8) shows the photomicrographs of some significant pollen types recorded in pollen loads.

DISCUSSION

Pollen grains serve as sources of proteins, lipids, minerals and vitamins for the honey bees, of which proteins are essential for building the body tissues and brood rearing. The local abundance of a taxon coupled with the nutritive potential of its pollen, determines the floral fidility of the honey bees.

In the present study a total of 9 pollen types viz., *Alangium salvifolium* (Alangiaceae), *Albizia lebbek, Leucaena leucocephala* (Mimosoideae), *Borassus flabellifer, Cocos nucifera* (Arecaceae), *Cucumis sativus* (Cucurbitaceae), *Feronia elephantum* (Rutaceae), *Phyllanthus emblica* (Euphorbiaceae) and *Syzygium cumini* (Myrtaceae) referable to 7 families were recorded. The status of *Borassus* Pollen in the unifloral and mixed loads, coupled with the frequency of occurrence of this pollen type in the overall loads analysed, indicates in no uncertain manner that *Borassus* plants constitute the major pollen source for *Apis cerana* bees in Krishna District.

Borassus flabellifer (the Palmyra palm) is encountered extensively, often in pure strands in the agricultural tracts of Krishna district. Each spadix of the male plants has a number of stout cylindrical branches bearing numerous small whitish-green or cream-coloured flowers. There are six stamens per male flower and each stamen shows on the average 9700 pollen grains. As thousands of male flowers are found in each plant the overall pollen productivity of the male plants is indeed very abundant, and no wonder a variety of bees including honey bees are attracted to the *Borassus* plants to feed upon their pollen.

ACKNOWLEDGEMENTS

We are thankful to Shri K. Basavapoornaiah, beekeeper, for his help in the procurement of pollen loads. The financial assistance provided by the Council of Scientific and Industrial Research (CSIR), New Delhi, to one of us (T.P.Kalpana, RA) is gratefully acknowledged.

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(Received 23.8.95; Accepted 5.1.96)