Summer pollen sources to *"Apis dorsata"* honey bees in deciduous forest of Mahboobnagar District, Andhra Pradesh

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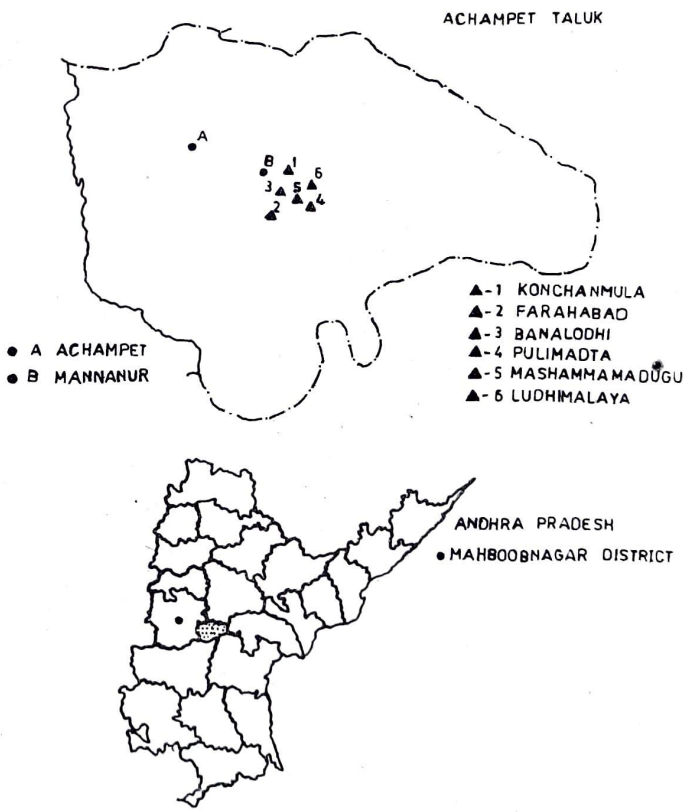
Seven hundred fifteen pollen loads recovered directly from the honey combs of *Apis dorsata* (Rock bee) collected in June, 1990 from the Mannanur forest range of Mahboobnagar District, Andhra Pradesh were analysed. 618 (86.4%) pollen loads were found to be unifloral, 89 (12.4%) bifloral and 8 (1.1%) multifloral. 79.6% of the unifloral pollen loads were of *Aegle marmelos*. *Caesalpinia bonduc, Terminalia alata, Grewia* sp., and *Capparis grandis* constitute the significant pollen types of the remaining unifloral loads. The pollen of *Aegle marmelos* were recovered from 571 (79.8%) of the total pollen loads studied. The study highlights *Aegle marmelos* (Rutaceae) as the major pollen source, and *Caesalpinia bonduc* (Caesalpiniaceae) *Grewia* sp. (Tiliaceae), *Capparis grandis* (Capparidaceae) and *Terminalia alata* (Combretaceae) as fairly important sources of pollen to the honey bees during the summer period.

Key-words - Pollen sources, honey bees, deciduous forest, Mahboobnagar, Andhra Pradesh.

INTRODUCTION

Honey bees visit plants for nectar and pollen. Nectar consisting predominantly of sucrose often associated with limited quantities of glucose and fructose is consumed as a source of energy and pollen grains provide the chief source of protein requirements of the bees essential for building their body tissues, particularly during the early embryonic growth. Bees prefer the nectar of a plant species that has the maximum sugar concentration. Similarly they prefer the pollen type with the maximum nutritive value and palatability. Melittopalynological investigations involving honey samples and pollen loads furnish reliable information on the relative preferences of the honey bees among the floral sources available within their foraging range. Analysis of pollen loads unravels the floral fidelity or fixity of the bees to a particular plant species in any floristic community, by highlighting the numerical status of the pollen types in the individual loads. The quantification of the data would help us to recognize the major and minor sources of pollen in any particular area.

Studies involving the analysis of pollen loads are few when compared to those of honeys, in the Indian context. In recent years Sharma (1970, 1972) and Chaturvedi (1973) studied the pollen loads of *Apis cerana*, the Indian hive bee, from Kangra in Himachal Pradesh and Banthra in the vicinity of Lucknow. Seethalakshmi and Percy (1980) recognized *Borassus flabellifer* as a good pollen source in



Text-figure 1. Location sites of honey samples studied.

Tamilnadu by analysing 900 pollen loads of *Apis cerana*. Moses *et al.* (1987) provided analysis of numerous pollen loads of *Apis cerana* at Vijayarai in West Godavari district of Andhra Pradesh, and recognized the potential of this region for apiculture. Recently Kalpana, Khatija and Ramanujam (1990) and Ramanujam and kalpana (1990) provided information on the pollen sources of *Apis florea* and *Apis cerana* honey bees in Hyderabad and Ranga Reddy districts.

Bulk of honey from the deciduous forests of Mahboobnagar district in Andhra Pradesh is obtained from the honey combs of the Rock bee, *Apis dorsata*. This study is aimed to recognize the major and minor sources of pollen to *Apis dorsata* bees in these deciduous forests during the summer period (honey flow season) on the basis of a qualitative and quantitative analysis of numerous pollen loads recovered directly from various honey combs.

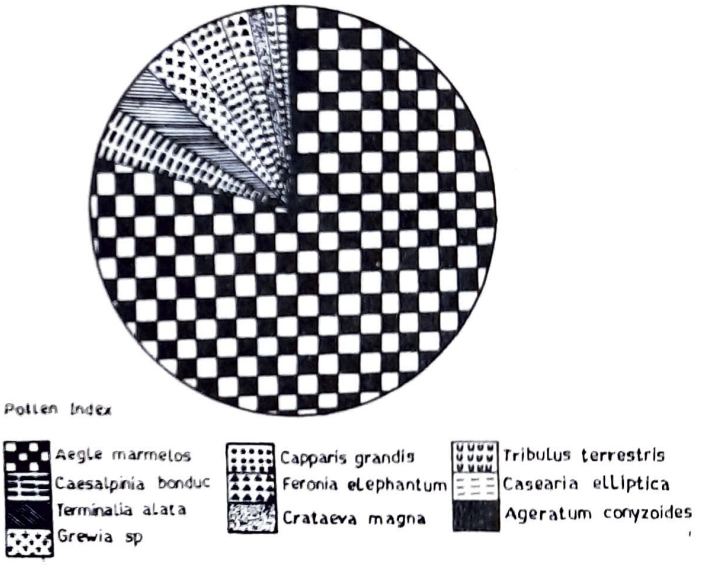
MATERIAL AND METHOD

Pollen loads (comb loads), 715 in number, of *Apis dorsata* were obtained from six honey combs collected in June, 1990 from the deciduous forest of the Mannanur forest range of Achampet taluk in Mahboobnagar district. These include 100 loads from konchanmula (M-Ma-k-8a), 65 from Farahabad (M-Ma-F-9a), 175 from Pulimadta (M-Ma-Pμ-12a) and 125 each from Banalodhi (M-Ma-B-11a), Mashammamadugu (M-Ma-Mas-13a) and Ludhimalaya (M-Ma-Lu-14a) villages (Text-fig.1).

The pollen grains of each pollen load were dispersed in 1 ml of glacial acetic acid and later on subjected to acetolysis. Two slides were prepared for each pollen load and microscopically examined. All such pollen loads consisting of a single pollen type represent unifloral loads; those with two pollen types bifloral, and with more than two, multifloral (Sharma, 1970). Identification of the pollen types was based upon the reference palynoslides of the forest flora and the relevant literature. The pollen productivity of the significant taxa was computed using haemocytometer.

OBSERVATIONS

The anaylysis has brought to light that 618 (86.4%) loads were unifloral, 89 (12.4%) were bifloral and the remaining 8 (1.1%) loads multifloral. The pollen grains of 14 taxa referable to 12 families were recorded. These are *Aegle marmelos*, *Feronia elephantum* (Rutaceae), *Caesalpinia bonduc* (Caesalpiniaceae), *Grewia* sp. (Tiliaceae), *Capparis grandis*, *Crataeva magna* (*Capparidaceae*), *Terminalia alata* (Combretaceae), *Casearia elliptica* (Flacourtiaceae), *Buchanania lanzan* (Anacardiaceae), *Dichrostachys cinerea* (Mimosaceae), *Tribulus terrestris* (Zygophyllaceae), *Ageratum conyzoides* (Asteraceae), *Solanum* sp. (Solanaceae) and *Syzygium cumini* (Myrtaceae). Of these, except the herbaceous weeds, *Tribulus terrestris*, *Ageratum conyzoides* and *Solanum* sp., which represent the undergrowth, the remaining taxa are either arborescent members or shrubs of the Mannanur forest range.



Text-figure 2 - Composite spectrum of unifloral pollen loads.

The unifloral pollen loads include 492 (79.6%) of *Aegle marmelos*, 26 (4.2%) *Caesalpinia bonduc*, 24 (3.8%) *Terminalia alata*, 23 (3.7%) *Grewia* sp., 20 (3.2%) *Capparis grandis*, 13 (2.1%) *Feronia elephantum*, 9 (1.4%) *Crataeva magna*, 5 (0.8%) *Tribulus terrestris*, 4 (0.6%) *Casearia elliptica* and 2 (0.3%) *Ageratum conyzoides*.

Execpt *Feronia elephantum*, the remaining 13 taxa are represented by their pollen types in the bifloral pollen loads. The multifloral loads which are meagrely encountered showed the pollen types of *Aegle marmelos*, *Grewia* sp., *Dichrostachys cinerea*, *Terminalia alata*, *Buchanania lanzan*, *Capparis grandis*, *Crataeva magna*, *Caesalpinia bonduc* and *Tribulus terrestris in varying proportion* (Table 1).

PLATE 1

(all figures x 500)

1,2. *Aegle marmelos*; 3,4 *Crataeva magna*; 5,6*Terminalia alata*; 7,8 *Dichrostachys cinerea*; 9,10 *Casearia elliptica*; 11,12 *Caesalpinia bonduc*; 13,14 *Solanum* sp.; 15,16 *Feronia elephantum*; 17. *Ageratum conyzoides*, 18. *Tribulus terrestris*; 19.*Buchanania lanzan*; 20,21 *Grewia* sp.;

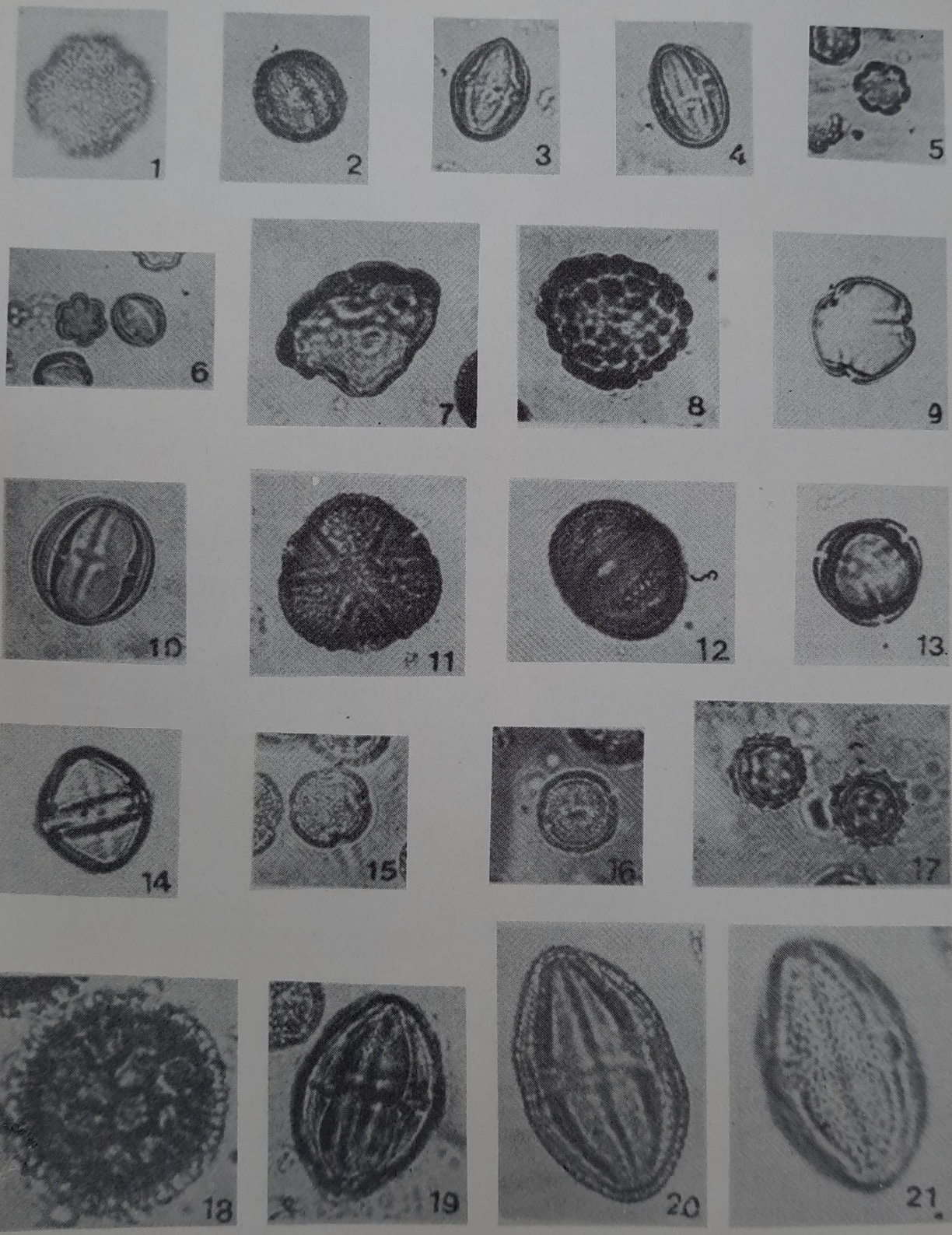


PLATE 1

Table 1- Analysis of pollen loads (PL) from honey combs

Comb No.	Total No. of PL examined	Unifloral loads		Bifloral loads		Multifloral loads	
		Number	Composition	Number	Composition (%)	Number	Composition (%)
M-Ma-K-8a	100	78	23- *Grewia* sp. 20- *Aegle marmelos* 11- *Terminalia, alata* 9- *Crataeva magna* (25-335) 5- *Tribulus terrestris* 4- *Capparis grandis* 4- *Casearia elliptica* 2- *Ageratum conyzoides*	18	4- *Grewia* sp. (60-70), *A. marmelos* (30-40) 3- *Grewia* sp. (65-75) *Caesalpimia bonduc* (25-335) 3- *Solanum* sp. (60-65), *C. elliptica* (35-40) 2- *Grewia* sp. (70-75), *C. magna* (25-30) 2- *C. magna* (75-78), *C. elliptica* (22-25) 2- *A. conyzoides* (60-65), *T. terrestris* (35-40) 1- *A. conyzoides* (62), *C. elliptica* (38) 1- *C. magna* (75) *C. bonduc* (25)	4	2- *C. magna* (50-60), *C. bonduc* (20-25), *Grewia* sp. (15-30) 2- *C. magna* (60-70), *Dichrostachys cinerea* (20-30) *T. terrestris* (20)
M-Ma-F-9a	65	54	18- *A. marmelos* 12- *C. grandis* 11- *C. bonduc* 10- *Feronia elephantum* 3- *T. alata*	11	4- *A. marmelos* (60-70), *D. cinerea* (30-40) 4- *A. marmelos* (45-75), *C. grandis* (25-55) 1- *A. marmelos* (75), *Buchanania lanzan (25)* *1- Syzygium cumini* (60), *C. elliptica* (40) 1- *A. marmelos* (60), *T. alata* (40)	Nil	
M-Ma-B-11a	125	118	105- *A. marmelos* 6- *T. alata* 4- *C. bonduc* 3- *F. elephantum*	6	2- *A. marmelos* (70-78) *C. bonduc* (22-30) 2- *A. marmelos* (60-75), *C. grandis* (25-40) 1- *A. marmelos* (78), *B. lanzan* (22) 1- *A. marmelos* (75), *C. elliptica* (25)	1	1- *A. marmelos* (60), *C. grandis* (30), *B. lanzan* (10)
M-Ma-Pu-12a	175	154	145- *A. marmelos* 9- *C. bonduc*	20	11- *A. marmelos* (55-75), *C. bonduc* (25-45) 3- *A. marmelos*	1	1- *A. marmelos* (50), *C. bonduc* (40), *B. lanzan* (10)

PLATE 2

(all figures x 250)

Pollen types in uniforal pollen loads recovered :

1. *Aegle marmelos*
2. *Terminalia alata*
3. *Feronia elephantum*
4. *Capparis grandis*
5. *Casearia elliptica*
6. *Ageratum conyzoides*7. *Caesalpinia bonduc*
8. *Grewia* sp.

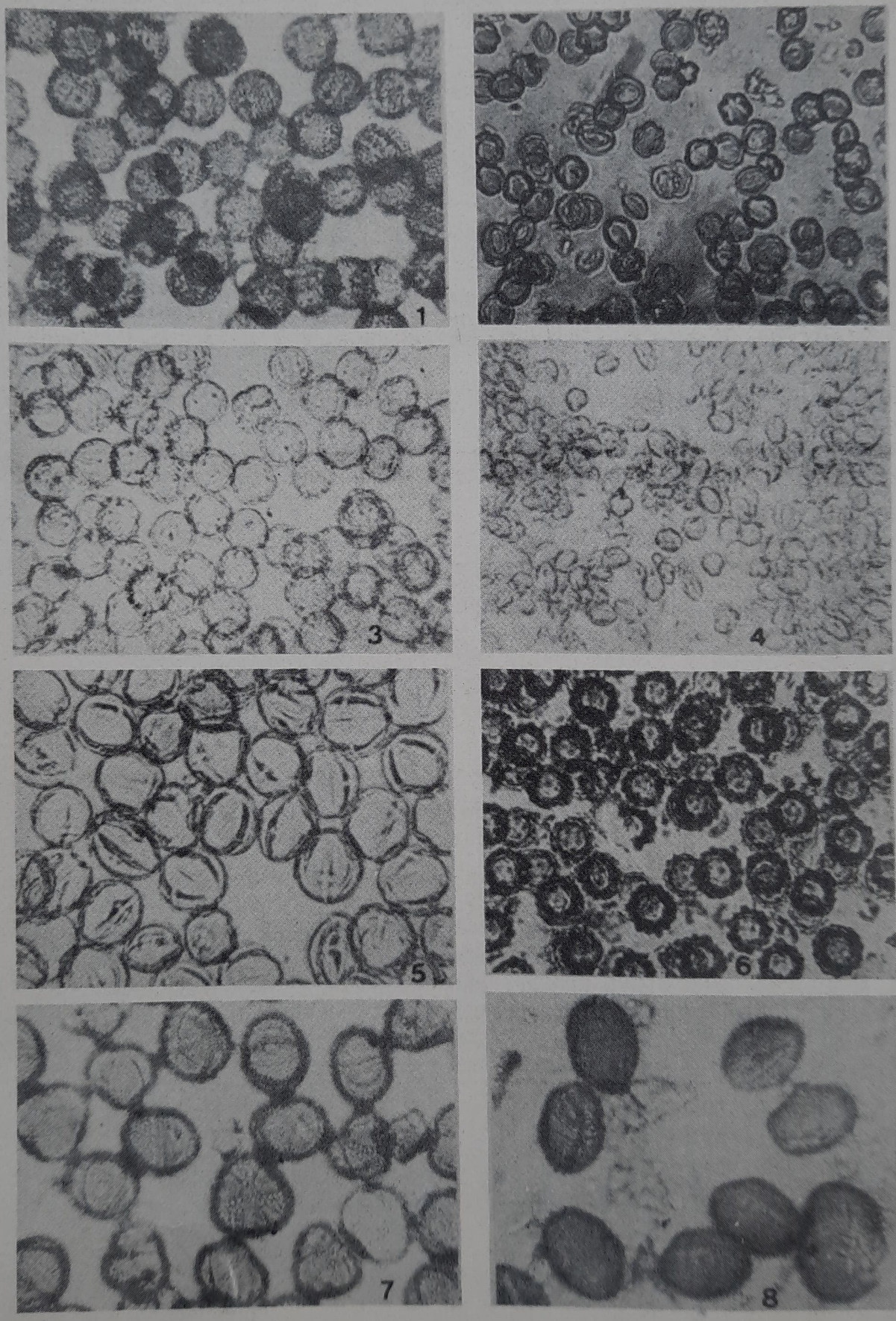


PLATE 2

					(60-75), *C. grandis* (25-40) 3- *A. marmelos* *(75-78),* *B. lanzan* (22-25) 3- *A. marmelos* (65-75), *T. alata* (25-35)		
M-Ma-Mas-13a	125	109	109- *A. marmelos*	15	10- *A. marmelos* (60-70), *C. bonduc* (30-40) 2- *A. marmelos* (75-78), *B. lanzan* (22-25) 1- *A. marmelos* (76), *C. elliptica* (24) 1- *A. marmelos* (70), *C. grandis* (30) 1- *A. marmelos* (70) *D. cinerea* (30)	1	1- *A. marmelos* (50) *T. alata* (40) *B. lanzan* (10)
M-Ma-Lu-14a	125	105	97- *A. marmelos* 4- *C. grandis* 2- *T. alata* 2- *C. bonduc*	19	5- *A. marmelos* (60-70), *C. grandis* (30-40) 4- *A. marmelos* (50-75) *C. bonduc* (25-50) 3- *A. marmelos* (60-70), *D. cinerea* (30-40) 3- *A. marmelos* (75-78), *B. lanzan* (25-28) 2- *A. marmelos* (65-75), *T. alata* (25-35) 2- *A. marmelos* (60-75), *C. elliptica* (25-40)	1	1- *A. marmelos* (65), *C. bonduc* (25) *B. lanzan* (10)

When the representation (irrespective of percentage) of the various pollen types in the total number of pollen loads studied was considered, the pollen of *Aegle marmelos* were noted in as many as 571 loads (79.8%), followed by those of *Caesalpinia bonduc* in 64 loads (8.9%). A composite pollen spectrum is provided (Text-fig. 2) to highlight the numerical status of the diverse unifloral loads encountered in the total number of pollen loads studied.

There is a perceptible variation in the colour of the unifloral pollen loads, viz., dark brown *(Crataeva magna),* whitish grey *(Ageratum conyzoides),* reddish brown *(Grewia* sp.), orange yellow *(Caesalpinia bonduc)* and various shades of yellow *(Feronia elephantum, Aegle marmelos, Terminalia alata, Capparis grandis, Tribulus terrestris* and *Casearia elliptica).* Figs. 1-21 of pl. 1 represent the pollen of significant taxa and figs. 1-8, of pl. 2, the pollen types of some of the unifloral pollen loads. Table 2 provides information on the pollen productivity of the significant taxa.

Tables 2- Pollen productivity of the significant taxa

Name	Pollen grains per anther
Aegle marmelos	12,800
Capparis grandis	55,800
Caesalpinia bonduc	4,800
Grewia sp.	6,200
Terminalia alata	3,900

DISCUSSION

The analysis showed that the pollen loads obtained from

the bee hives of *Apis dorsata* in the Mannanur forest range originated predominantly from some of the characteristic arborescent and shrubby plants of this deciduous forest, viz., *Aegle marmelos*, *Caesalpinia bonduc*, *Terminalia alata*, *Grewia* sp., *Buchanania lanzan*, *Dichrostachys cinerea*, *Capparis grandis*, *Crataeva magna*, *Casearia elliptica*, *Syzgium cumini* and *Feronia elephantum*. The contribution of the herbaceous weeds, *Tribulus terrestris*, *Solanum* sp., and *Ageratum conyzoides* as pollen source to *Apis dorsata* bees is very meagre.

The quantification of the data reveals unequivocally the predominance of the pollen of *Aegle marmelos*, as evidenced by its very high representation of 79.6% in the unifloral loads and 79.8% in the totality of the pollen load material studied. It can therefore be concluded that *Aegle marmelos* constitutes the major source of pollen to the honey bees during the summer period. The other fairly significant sources of pollen to the honey bees of this area are *Caesalpinia bonduc* (8.9%), *Grewia* sp. (4.9%), *Capparis grandis* (4.7%) and *Terminalia alata* (4.3%). All these taxa also constitute important nectar source during the summer season for the honey bees of this forest area (authors' unpublished work). The minor sources of pollen include *Buchanania lanzan*, *Dichrostachys cinerea*, *Crataeva magna*, *Casearia elliptica* and *Feronia elephantum*.

The pollen productivity data indicate that *Capparis grandis* and *Aegle marmelos* with 55,800 and 12,800 grains per anther respectively are the top two pollen producers. The distinct preference of *Apis dorsata* bees to the pollen of *Aegle marmelos* could be attributed to its abundance in the foraging area as well as its higher nutritive value.

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