Nectariferous plants for *Apis cerana* in Guntur District, Andhra Pradesh, India

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ABSTRACT

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The present investigation deals with the palynological study of seven honey samples obtained from various *Apis cerana* apiaries located in Guntur District, Andhra Pradesh. One honey sample, collected from Chinthalapudi, has been found to be unifloral whereas other honey samples are multifloral. Unifloral honey has single, predominant pollen type, i.e. *Mimosa pudica*. Pollen of *Psidium guajava*, *Capsicum frutescens*, *Justicia procumbens*, *Helianthus annuus*, *Ageratum conyzoides*, *Phoenix sylvestris*, *Leucas aspera*, *Mimosa pudica* were recorded as secondary pollen types in the multifloral honeys. These taxa were considered as chief bee forage and nectariferous plants during winter in Guntur District, Andhra Pradesh, India.

Key words: Nectariferous plants, honeys, *Apis cerana*, Guntur District, Andhra Pradesh, India.

INTRODUCTION

Beekeeping is an eco-friendly industry with no pollution. It produces honey in commercial scale and also involves pollination in the flowering plants. Guntur is one of the important districts in Andhra Pradesh, which has a good potential for beekeeping. The present palynological study presents analysis of 7 honey samples obtained from the different apiaries located in Guntur District of Andhra Pradesh.

MATERIAL AND METHOD

Seven honey samples were collected from seven different villages, viz. Kolakaluru (G-T-K-Ac-4b), Doppalapudi (G-P-D-Ac-9a), Pedavadlapudi (G-M-P-Ac-10a), Bapatla (G-B-B-Ac-11a), Thullur (G-T-T-Ac-12a), Chinthalapudi (G-P-C-Ac-13a) and Peddapudi (G-A-P-Ac-14a) during 2007-2008. These villages are located in 6 different mandals, viz. Tenali, Ponnur, Mangalagiri, Bapatla, Thullur and Amruthalur in Guntur District, Andhra Pradesh (Table 1, Text-figure 1).

The methodology recommended by the International Commission of Bee Botany (Louveaux et al. 1978) was employed for the recovery and analysis of the pollen contents from apiary honey samples. 1 ml of honey sample was dissolved in 10 ml of distilled water and centrifuged. The resultant sediment was treated with 5 ml of glacial acetic acid. The glacial acetic acid was decanted and the material was subjected to

Table 1. Inventory of the winter honey samples collected from *Apis cerana.*

Sample code	Village	Mandal	Date of collection
1. G-T-K-Ac-4b	Kolakaluru	Tenali	05-02-2008
2. G-P-D-Ac-9a	Doppalapudi	Ponnur	12-12-2007
3. G-M-P-Ac-10a	Pedavadlapudi	Mangalagiri	16-01-2008
4. G-B-B-Ac-11a	Bapatla	Bapatla	02-02-2008
5. G-T-T-Ac-12a	Thullur	Thullur	04-02-2008
6. G-P-C-Ac-13a	Chinthalapudi	Ponnur	04-02-2008
7. G-A-P-Ac-14a	Peddapudi	Amruthalur	02-02-2008

acetolysis technique (Erdtman 1960). Two pollen slides, prepared for each sample, were scanned and analyzed palynologically. For quantification of pollen types, 300 pollen grains per sample were counted.
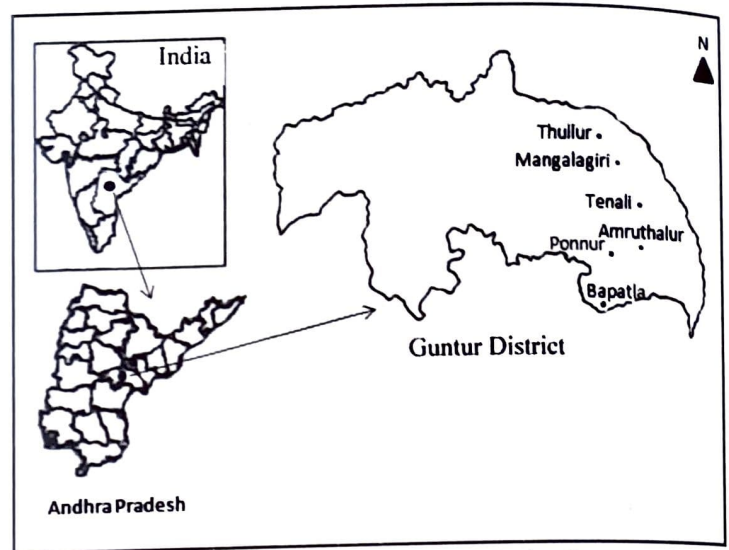
Text-figure 1. Location of various mandals in Guntur District, Andhra Pradesh, where honey collection localities are situated.
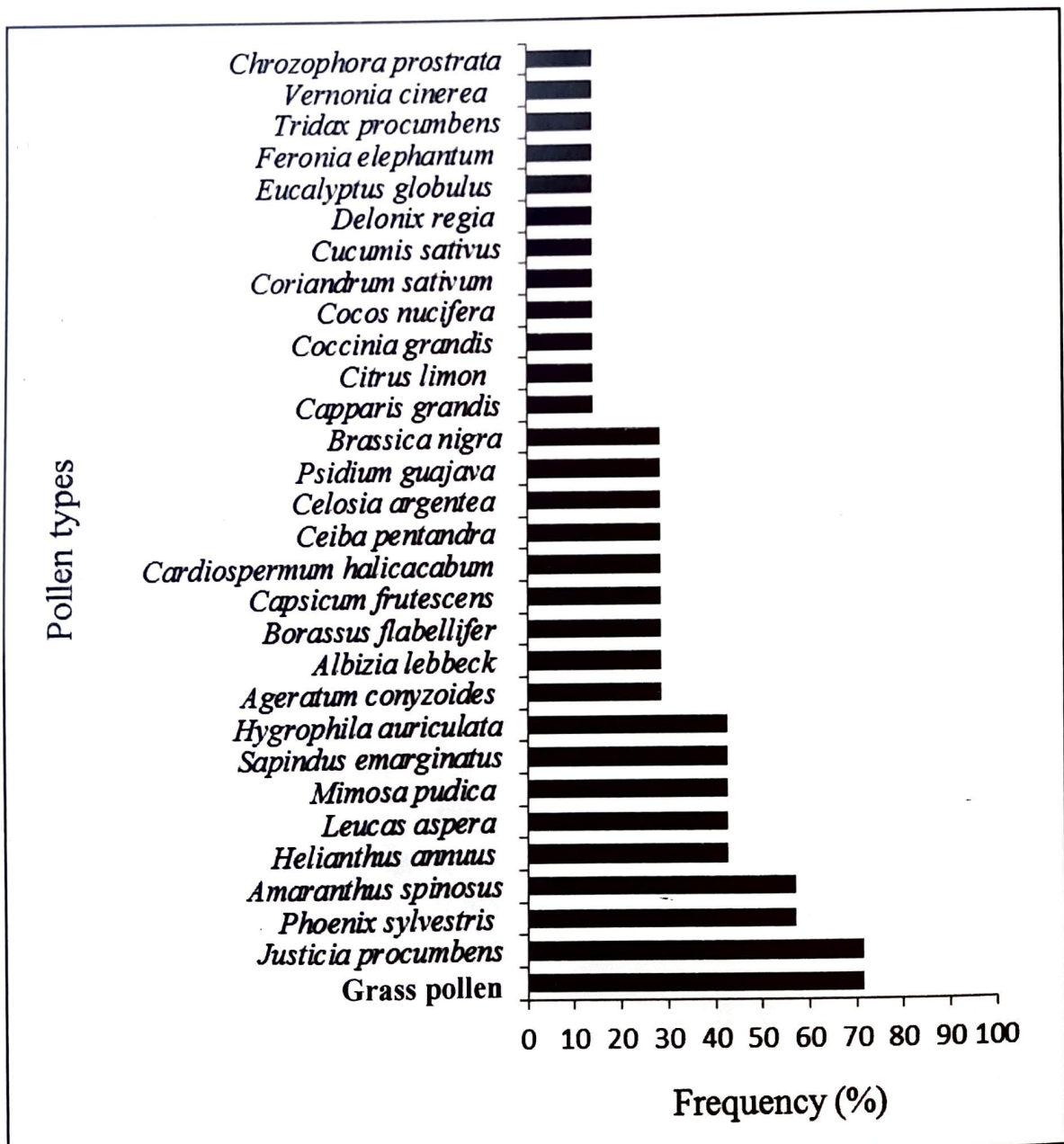

Text-figure 2. Pollen distribution in winter honeys of Guntur district, Andhra Pradesh.

OBSERVATION

All the seven honey samples were palynologically analyzed and recorded 30 pollen types, viz. *Ageratum conyzoides, Albizia lebbeck, Amaranthus spinosus, Borassus flabellifer, Brassica nigra, Capparis grandis, Capsicum frutescens, Cardiospermum halicacabum, Ceiba pentandra, Celosia argentea, Chrozophora prostrata, Citrus limon, Coccinia grandis, Cocos nucifera, Coriandrum sativum, Cucumis sativus, Delonix regia, Eucalyptus globulus, Feronia elephantum,* grass pollen, *Helianthus annuus, Hygrophila auriculata, Justicia procumbens, Leucas aspera, Mimosa pudica, Phoenix sylvestris, Psidium guajava, Sapindus emarginatus, Tridax procumbens* and *Vernonia cinerea* belong to 18 families, viz. Apiaceae, Bombacaceae, Brassicaceae, Caesalpiniaceae, Capparidaceae, Euphorbiaceae, Lamiaceae, Poaceae, Solanaceae, Acanthaceae, Amaranthaceae, Cucurbitaceae, Mimosaceae, Myrtaceae, Rutaceae, Sapindaceae, Arecaceae and Asteraceae (Plate 1). Of these, grass pollen was considered as non-melliferous pollen type.

Based on pollen frequencies, these honey samples are classified as predominant (P = >45%),
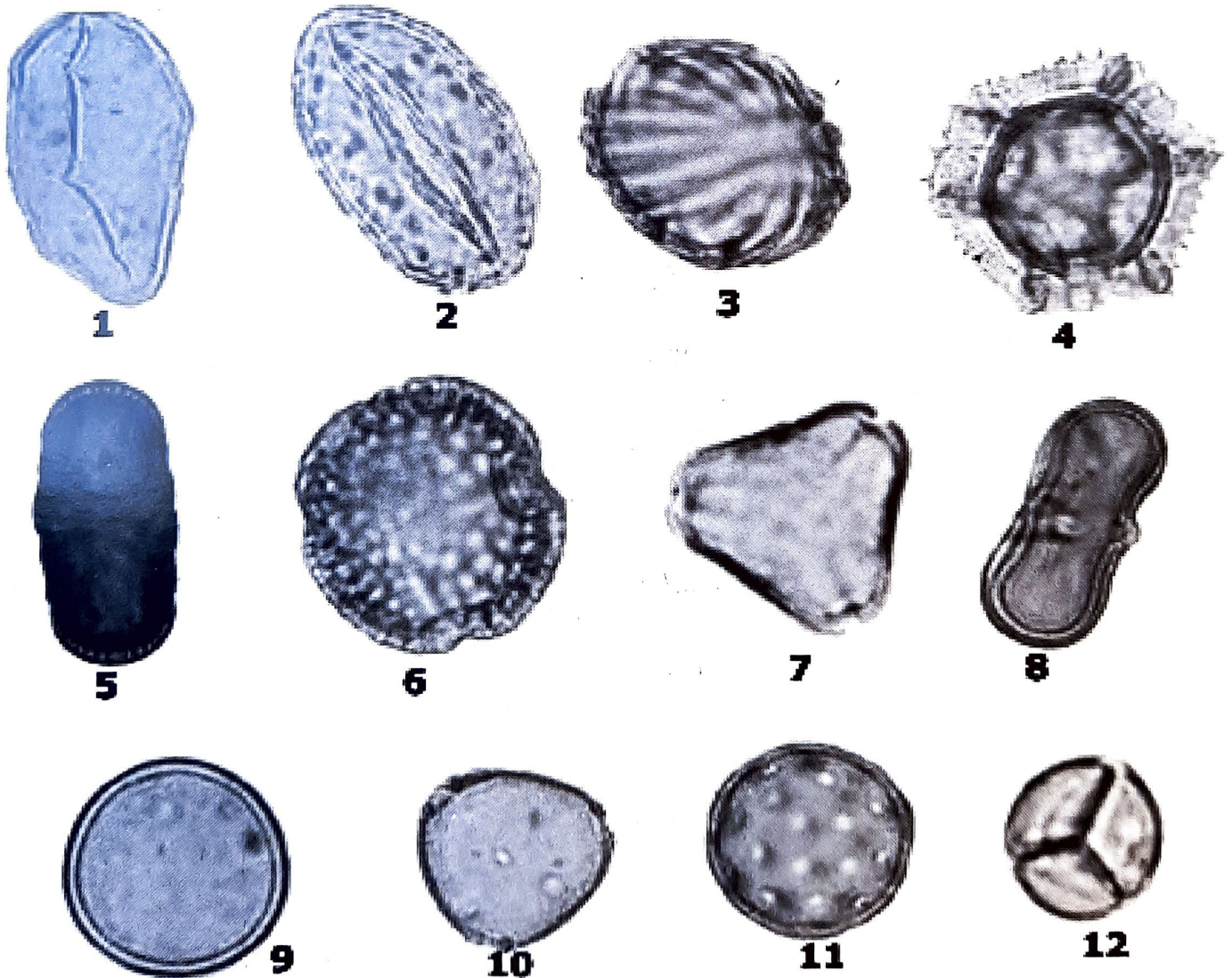
Plate 1

1. *Cocos nucifera.* 2. *Borassus flabellifer.* 3. *Hygrophila auriculata.* 4. *Vernonia cinerea.* 5. *Justicia procumbens.* 6. *Feronia elephantum.* 7. *Eucalyptus globules.* 8. *Coriandrum sativum.* 9. Grass pollen. 10. *Cucumis sativus.* 11. *Amaranthus spinosus.* 12. *Mimosa pudica.*

secondary (S = 16-45%), important minor (I = 3-15%) and minor (M = <3%) pollen frequency types.

POLLEN ANALYSIS OF HONEY SAMPLES

1. G-T-K-Ac-4b

P: Nil.

S: *Psidium guajava* (16.48%), *Capsicum frutescens* (16.48%), *Justicia procumbens* (18.31%).

I: *Citrus limon* (4.76%), *Eucalyptus globulus* (9.15%), *Mimosa pudica* (7.32%), *Phoenix sylvestris* (3.66%), *Sapindus emarginatus* (5.49%), *Amaranthus spinosus* (3.66%), *Borassus flabellifer* (12.82%).

M: *Cocos nucifera* (1.87%).

2. G-P-D-Ac-9a

P: Nil.

S: *Helianthus annuus* (31.74%), *Ageratum conyzoides* (19.04%).

I: Grass pollen (12.77%), *Cucumis sativus* (12.69%), *Celosia argentea* (7.93%), *Tridax procumbens* (6.34%), *Coriandrum sativum* (3.8%).

M: *Delonix regia* (1.58%), *Chrozophora prostrata* (2.53%), *Hygrophila auriculata* (1.58%).

3. G-M-P-Ac-10a

P: Nil.

S: *Phoenix sylvestris* (34.09%), *Helianthus annuus* (19.88%).

I: *Capparis grandis* (11.36%), *Celosia argentea* (7.14%), *Justicia procumbens* (6.53%), *Brassica nigra* (6.25%), *Sapindus emarginatus* (4.82%), *Amaranthus spinosus* (4.26%).

M: *Cardiospermum halicacabum* (1.42%), *Capsicum frutescens* (1.42%). *Hygrophila auriculata* (1.13%), *Feronia elephantum* (0.85%), *Vernonia cinerea* (0.85%)

4. G-B-B-Ac-11a

P: Nil.

S: *Leucas aspera* (39.67%), *Helianthus annuus* (25.97%).

I: *Ageratum conyzoides* (15.34%), *Brassica nigra* (10.96%), grass pollen (5.72%).

M: *Amaranthus spinosus* (2.34%).

5. G-T-T-Ac-12a

P: Nil.

S: Grass pollen (40.47%), *Justicia procumbens* (35.04%).

I: *Leucas aspera* (14.94%), *Phoenix sylvestris* (6.82%).

M: *Hygrophila auriculata* (2.73%).

6. G-P-C-Ac-13a

P: *Mimosa pudica* (50.78%).

S: Nil.

I: *Sapindus emarginatus* (13.71%), grass pollen (11.71%), *Justicia procumbens* (9.76%), *Phoenix sylvestris* (5.85%), *Amaranthus spinosus* (5.85%).

M: *Albizia lebbeck* (1.17%), *Ceiba pentandra* (1.17%).

7. G-A-P-Ac-14a

P: Nil.

S: *Mimosa pudica* (28.26%), grass pollen (28.66%).

I: *Psidium guajava* (8.83%), *Justicia procumbens* (7.77%), *Borassus flabellifer* (7.77%), *Leucas aspera* (7.05%), *Ceiba pentandra* (7.16%).

M: *Albizia lebbeck* (1.97%), *Cardiospermum halicacabum* (2.53%).

DISCUSSION

Of the seven honey samples, six are multifloral. Only one honey sample is unifloral with *Mimosa pudica* (50.78%). Pollen of *Psidium guajava*, *Capsicum frutescens*, *Justicia procumbens*, *Helianthus annuus*, *Ageratum conyzoides*, *Phoenix sylvestris*, *Leucas aspera* and grass were recorded as secondary pollen types in the multifloral honeys. Of these, grass pollen are non-melliferous. *Mimosa pudica* was also recorded as secondary pollen type in multifloral honeys. But, no secondary pollen type was recorded in unifloral

honey. In these honey samples, G-M-P-Ac-10a sample has maximum number (13) of pollen types and G-T-T-Ac-12a sample has minimum number (5) of pollen types.

Based on frequency distribution, pollen types in these honey samples were classified as very frequent (>50%), frequent (21-50%), infrequent (10-20%) and rare (<10%). The very frequent pollen types in these honey samples are pollen of grass (71.42%), *Justicia procumbens* (71.42%), *Phoenix sylvestris* (57.14%) and *Amaranthus spinosus* (57.14%). *Helianthus annuus, Leucas aspera, Mimosa pudica, Sapindus emarginatus, Hygrophila auriculata, Ageratum conyzoides, Albizia lebbeck, Borassus flabellifer, Capsicum frutescens, Cardiospermum halicacabum, Ceiba pentandra, Celosia argentea, Psidium guajava* and *Brassica nigra* pollen types are frequent. Pollen of *Capparis grandis, Citrus limon, Coccinia grandis, Cocos nucifera, Coriandrum sativum, Cucumis sativus, Delonix regia, Eucalyptus globulus, Feronia elephantum, Tridax procumbens, Vernonia cinerea, Chrozophora prostrata* are infrequent group. No rare pollen types were reported in these honey samples (Text-figure 2).

Some of the pollen types, recorded in the present study, e.g. *Ageratum conyzoides, Capsicum frutescens, Celosia argentea, Justicia procumbens, Cocos nucifera, Helianthus annuus, Amaranthus spinosus, Borassus flabellifer, Brassica nigra, Hygrophila auriculata* and *Feronia elephantum*, have also been recorded in the honeys of Ranga Reddy, Guntur, Nizamabad, Khammam and Adilabad districts of Andhra Pradesh. (Ramanujam et al. 1992, Ramakrishna & Bushan 2006, Reddy & Reddy 2008, Swathi & Ramakrishna 2013).

The pollen of *Justicia procumbens, Phoenix sylvestris* and *Amaranthus spinosus*, which are frequent, are considered as important bee forage and nectariferous plants for *Apis cerana* during winter season. The other significant nectariferous plants in this area are *Helianthus annuus, Leucas aspera, Mimosa pudica, Sapindus emarginatus, Hygrophila auriculata, Ageratum conyzoides, Albizia lebbeck, Borassus flabellifer, Capsicum frutescens, Cardiospermum halicacabum, Ceiba pentandra, Celosia argentea, Psidium guajava* and *Brassica nigra*. Pollen of *Mimosa pudica* has been recorded, for the first time, as major pollen type in the unifloral honey. It is therefore recognized as chief bee forage and nectariferous plant for *Apis cerana* in Guntur District of Andhra Pradesh during winter season.

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