

Diversity in pollen characterization of squeezed honey samples from Nizamabad district, Andhra Pradesh

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The paper incorporates a melittopalynological investigation of squeezed summer honeys of *Apis dorsata* from Sirikonda and Machareddy mandals of Nizamabad district, Andhra Pradesh. Of the 25 honey samples from Sirikonda mandal, 22 were found to be unifloral honeys of *Lannea coromandelica*, *Terminalia arjuna*, *Madhuca indica*, *Lagerstroemia parviflora*, *Sphaeranthus indicus* and *Opilia amentacea* and the remaining 3 multifloral honeys. Of the 8 honey samples from Machareddy mandal, 6 were found to be unifloral honeys of *Opilia amentacea*, *Madhuca indica*, *Lagerstroemia parviflora* and *Careya arborea* and the remaining two multifloral honeys. There is a remarkable difference in the overall pollen contents of the honeys of these two mandals despite their geographical proximity.

Key-words—Diversity, Squeezed honey, Nizamabad District, Andhra Pradesh.

INTRODUCTION

NIZAMABAD district of Andhra Pradesh is known for the richness of its tropical deciduous forest as well as cultivated lands. Though Sirikonda and Machareddy are neighbouring mandals, the former has more forest area than the latter.

Twenty five squeezed honey samples of *Apis dorsata* were collected from Kottalapally (22 samples), Vanasipet (2 samples) and Kondapoor (1 sample) in Sirikonda mandal and 8 samples were from Maddikuti village in Machareddy mandal of Nizamabad district, Andhra Pradesh during summer season (Table 1)

The methodology recommended by the International Commission of Bee Botany (Louveaux *et al.* 1978) was employed for the recovery of pollen contents and their analysis. 1 ml of honey sample was dissolved in 10 ml of water and centrifuged, and subjected to acetolysis (Erdtman 1960). The pollen types were identified with the help of reference slide collection of local flora and relevant literature.

Table.1 Inventory of honey samples

| Code | Name of the mandal | Name of village |
|---------------|--------------------|-----------------|
| N-SR-K-Ad-22 | Sirikonda | Kottalapally |
| N-SR-K-Ad-23 | " | Kottalapally |
| N-SR-K-Ad-24 | " | Kottalapally |
| N-SR-K-Ad-25 | " | Kottalapally |
| N-SR-K-Ad-26 | " | Kottalapally |
| N-SR-Ko-Ad-30 | " | Kondapoor |
| N-SR-K-Ad-31 | " | Kottalapally |
| N-SR-K-Ad-32 | " | Kottalapally |
| N-SR-K-Ad-33 | " | Kottalapally |
| N-SR-K-Ad-34 | " | Kottalapally |
| N-SR-K-Ad-35 | " | Kottalapally |
| N-SR-K-Ad-38 | " | Kottalapally |
| N-SR-K-Ad-39 | " | Kottalapally |
| N-SR-K-Ad-40 | " | Kottalapally |
| N-SR-V-Ad-41 | " | Vanasipet |
| N-SR-V-Ad-42 | " | Vanasipet |
| N-SR-K-Ad-49 | " | Kottalapally |
| N-SR-K-Ad-50 | " | Kottalapally |
| N-SR-K-Ad-51 | " | Kottalapally |
| N-SR-K-Ad-52 | " | Kottalapally |
| N-SR-K-Ad-53 | " | Kottalapally |
| N-SR-K-Ad-54 | " | Kottalapally |
| N-SR-K-Ad-55 | " | Kottalapally |
| N-SR-K-Ad-59 | " | Kottalapally |
| N-SR-K-Ad-60 | " | Kottalapally |
| N-M-M-Ad-27 | Machareddy | Maddikuti |
| N-M-M-Ad-28 | " | Maddikuti |

| | | |
|-------------|---|-----------|
| N-M-M-Ad-29 | “ | Maddikuti |
| N-M-M-Ad-36 | “ | Maddikuti |
| N-M-M-Ad-37 | “ | Maddikuti |
| N-M-M-Ad-56 | “ | Maddikuti |
| N-M-M-Ad-57 | “ | Maddikuti |
| N-M-M-Ad-58 | “ | Maddikuti |

| | |
|------------------------|--------------------------|
| N = Nizamabad District | K = Kottalapally village |
| SR = Sirikonda Mandal | Ko = Kondapoor village |
| M = Machareddy Mandal | V = Vanasipet village |
| | M = Maddikuti village |

OBSERVATION

Sirikonda Mandal

Twenty two unifloral honey samples were collected from Sirikonda Mandal. Nine of these samples were found to be predominant with *Lannea coromandelica* (80.74% in Ad-22; 80.08% in Ad-23; 80.37% in Ad-25; 73% in Ad-26; 74% in Ad-41, 80.2% in Ad-49, 80.75% in Ad-50; 82.25% in Ad-51; 82.29% in Ad-52) and two with *Terminalia arjuna* (71% in Ad-59 and 65.28% in Ad-60). *Madhuca indica* (48.33% in Ad-24, 59.3% in Ad-35,) and *Lagerstroemia parviflora* (62.4% in Ad-54, 60.7% in Ad-55) were identified as predominant types in two samples each and in the remaining two samples *Sphaeranthus indica* (53.03% in Ad-24) and *Opilia amentacea* (62.81% in Ad-30) were found to be unifloral. *Madhuca indica*, *Careya arborea* and *Schleichera oleosa* constituted the secondary pollen types in multifloral honeys (Ad-31, Ad-32 and Ad-33). The other important pollen types recorded were *Bombax ceiba*, *Helianthus annuus*, *Ramphicarpa longifolia*, *Peltophorum ferrugineum*, *Ageratum conyzoides*, *Seasamum indicum*, *Aegle marmelos*, *Alangium salvifolium*, *Phoenix sylvestris*, *Syzygium cumini*, *Evolvulus alsinoides*, *Croton bonplandianum*, *Albizia lebbeck*, *Holarrhena pubescens*, *Sonchus oteraceous*, and *Clerodendron inerme*.

A total of 22 pollen types (21 melliferous and 1 non-melliferous taxa) referable to 21 families were

recorded from Sirikonda mandal. The sample Ad-33 showed maximum number of pollen types (12) and the sample Ad-53 showed the minimum number of Pollen types (4).

Machareddy Mandal

In the Machareddy mandal, *Opilia amentacea* was found as a predominant pollen type in 3 samples ranging from 60.33 to 71.2% (66.5% in Ad-27, 71.2% in Ad-28 and 60.33% in Ad-37) *Madhuca indica* (54.65% in Ad-36) as the predominant pollen type in one sample. The remaining two samples were found to be unifloral with *Lagerstroemia parviflora* (52.08% in Ad-56) *Careya arborea* (45.1% in Ad-57) as the predominant pollen type. In the multifloral honey samples (Ad-29, Ad-58) *Madhuca indica*, *Opilia amentacea*, *Terminalia arjuna*, *Schleichera oleosa* and *Careya arborea* constituted the secondary pollen types. The other significant pollen types recorded were *Clerodendron inerme*, *Ageratum conyzoides*, *Lannea coromandelica*, *Alangium salvifolium* and *Albizia lebbeck* (Table-1).

Eleven pollen types referable to 10 families were recorded from Machareddy honeys. The sample Ad-37 showed the maximum number of pollen types (9) and the sample Ad-56 the minimum number (5)

Pollen analysis of honey samples.

N-SR-K-Ad-22

P - *Lannea coromandelica* (80.74)

S - Nil

I - *Schleichera oleosa* (8.49), *Opilia amentacea* (5.66)

M - *Helianthus annuus* (2.49), *Careya arborea* (1.83), *Madhuca indica* (0.49), *Terminalia arjuna* (0.3).

N-SR-K-Ad-23

P - *Lannea coromandelica* (80.08)

S - Nil

I - *Bombax ceiba* (8.24), *Madhuca indica* (3.86)

M - *Helianthus annuus* (2.28), *Schleichera oleosa* (2.24), *Careya arborea* (1.83), *Opilia amentacea* (1.47).

N-SR-K-Ad-24

P - *Sphaeranthus indicus* (53.03)

S - *Lannea coromandelica* (34.8)

I - *Opilia amentacea* (4.37), *Helianthus annuus* (3.81) *Madhuca indica* (0.83), *Terminalia arjuna* (0.26)

N-SR-K-Ad-25

- P - *Lannea coromandelica* (80.37)
 S - Nil
 I - *Opilia amentacea* (6.87), *Helianthus annuus* (4.5),
Madhuca indica (4.14)
 M - *Bombax ceiba* (2.62), *Careya arborea* (1.5)

N-SR-K-Ad-26

- P - *Lannea coromandelica* (73.0)
 S - *Schleichera oleosa* (16.0)
 I - Nil
 M - *Careya arborea* (2.7), *Madhuca indica* (2.4),
Bombax ceiba (1.58), *Rhamphicarpa longiflora* (1.06),
Terminalia arjuna (1.0), *Peltophorum ferrugineum*
 (0.86), Unknown pollen (0.8), Compositae type (0.6)

N-M-M-Ad-27

- P - *Opilia amentacea* (66.5)
 S - Nil
 I - *Lannea coromandelica* (12.8), *Schleichera oleosa* (7.4),
Madhuca indica (5.6), *Terminalia arjuna* (3.35),
Careya arborea (3.05)

- M - *Lagerstroemia parviflora* (1.3)

N-M-M-Ad-28

- P - *Opilia amentacea* (71.2)
 S - Nil
 I - *Madhuca indica* (14.07), *Terminalia arjuna* (3.76),
Lannea coromandelica (3.65), *Lagerstroemia*
parviflora (3.11)

- M - *Schleichera oleosa* (2.69), *Careya arborea* (1.15),
Alangium salvifolium (0.37)

N-M-M-Ad-29

- P - Nil
 S - *Madhuca indica* (39.0), *Opilia amentacea* (37.4)
 I - *Lagerstroemia parviflora* (9.88), *Schleichera oleosa*
 (6.44), *Terminalia arjuna* (5.28)

- M - *Careya arborea* (2.0)

N-SR-Ko-Ad-30

- P - *Opilia amentacea* (62.81)
 S - Nil
 I - *Schleichera oleosa* (11.45), *Careya arborea* (10.4),
Lannea coromandelica (9.72), *Madhuca indica* (4.68)
 M - *Terminalia arjuna* (0.5),
Helianthus annuus (0.44)

N-SR-K-Ad-31

- P - Nil
 S - *Madhuca indica* (35.0)
Careya arborea (34.75)
 I - *Schleichera oleosa* (11.51), *Opilia amentacea* (7.16),
Lannea coromandelica (6.83)

- M - *Aegle marmelos* (2.9), *Sesamum indicum* (1.85).

- NMP - Grass pollen type (7.83)

N-SR-K-Ad-32

- P - Nil
 S - *Madhuca indica* (42.82), *Schleichera oleosa* (23.88)
 I - *Aegle marmelos* (14.88), *Careya arborea* (4.44).
Alangium salvifolium (4.99), *Terminalia arjuna* (3.22)
 M - *Opilia amentacea* (2.44), *Phoenix sylvestris* (2.11),
Sesamum indicum (1.22)

- NMP - Grass pollen type (1.88)

N-SR-K-Ad-33

- P - Nil
 S - *Madhuca indica* (42.08)
Schleichera oleosa (23.25)
 I - *Phoenix sylvestris* (9.83), *Opilia amentacea* (6.5),
Terminalia arjuna (6.0)
 M - *Lagerstroemia parviflora* (2.92), *Syzygium cumini* (2.5),
Aegle marmelos (2.08), *Helianthus annuus* (1.66),
Careya arborea (1.58), *Alangium salvifolium* (1.6)

- NMP - Grass pollen type (1.0)

N-SR-K-Ad-34

- P - *Madhuca indica* (48.33)
 S - *Lannea coromandelica* (17.0)
 I - *Schleichera oleosa* (11.76), *Lagerstroemia parviflora*
 (10.42), *Opilia amentacea* (6.14), *Terminalia arjuna* (5.0)
 M - *Alangium salvifolium* (0.47), *Phoenix sylvestris* (0.39),
Careya arborea (0.35), *Sphaeranthus indicus* (0.14)

N-SR-K-Ad-35

- P - *Madhuca indica* (59.3)
 S - *Schleichera oleosa* (18.0)
 I - *Lannea coromandelica* (8.5), *Careya arborea* (5.66),
Opilia amentacea (4.65)
 M - *Lagerstroemia parviflora* (2.5), *Evolvulus alsinoides*
 (1.39)

N-M-M-Ad-36

- P - *Madhuca indica* (54.65)
 S - *Opilia amentacea*
 I - *Terminalia arjuna* (15.0)
 M - *Schleichera oleosa* (0.86), *Careya arborea* (0.67),
Lagerstroemia parviflora (0.52)

N-M-M-Ad-37

- P - *Opilia amentacea* (60.33)
 S - Nil
 I - *Aegle marmelos* (12.3), *Lannea coromandelica* (10.1)
Madhuca indica (6.06), *Terminalia arjuna* (5.91)
 M - *Lagerstroemia parviflora* (2.04), *Careya arborea* (1.5),
Schleichera oleosa (1.0), *Albizia lebbek* (0.6), *Alangium*
salvifolium (0.16)

N-SR-K-Ad-38

- P - *Terminalia arjuna* (80.3)

- S - Nil
 I - *Madhuca indica* (12.38), *Lagerstroemia parviflora* (5.11)
 M - *Opilia amentacea* (2.05), *Croton bonplandianum* (0.16)
 N-SR-K-Ad-39
 P - *Terminalia arjuna* (45.5)
 S - *Aegle marmelos* (16.83)
 I - *Lagerstroemia parviflora* (12.13), *Opilia amentacea* (10), *Madhuca indica* (9.37)
 M - *Albizia lebbbeck* (2.28), *Sphaeranthus indicus* (2.0), *Holarrhena pubescence* (1.99)
 N-SR-K-Ad-40
 P - *Terminalia arjuna* (80.95)
 S - Nil
 I - *Holarrhena pubescens* (6.09), *Madhuca indica* (4.6)
 M - *Opilia amentacea* (2.63), *Aegle marmelos* (2.5), *Albizia lebbbeck* (2.0), *Croton bonplandianum* (1.23).
 N-SR-V-Ad-41
 P - *Lannea coromandelica* (74.0)
 S - Nil
 I - *Terminalia arjuna* (12.04), *Careya arborea* (5.5) *Madhuca indica* (3.69), *Schleichera oleosa* (3.6)
 N-SR-K-Ad-49
 P - *Lannea coromandelica* (80.2)
 S - Nil
 I - *Madhuca indica* (8.4), *Schleichera oleosa* (7.4)
 M - *Opilia amentacea* (2.1), *Terminalia arjuna* (1.9)
 N-SR-K-Ad-50
 P - *Lannea coromandelica* (80.75)
 S - Nil
 I - *Schleichera oleosa* (10.25) *Madhuca indica* (7.0)
 M - *Terminalia arjuna* (1.5) *Opilia amentacea* (0.5)
 N-SR-K-Ad-51
 P - *Lannea coromandelica* (82.25)
 S - Nil
 I - *Schleichera oleosa* (9.75), *Careya arborea* (3.9)
 M - *Madhuca indica* (2.1), *Opilia amentacea* (2.0)
 N-SR-K-Ad-52
 P - *Lannea coromandelica* (82.29)
- S - Nil
 I - *Schleichera oleosa* (7.01), *Careya arborea* (4.2), *Terminalia arjuna* (3.3), *Opilia amentacea* (3.2)
 M - Nil
 N-SR-K-AD-53
 P - *Lannea coromandelica* (71.0)
 S - *Schleichera oleosa* (25.08)
 I - *Careya arborea* (3.01)
 M - *Terminalia arjuna* (0.91)
 N-SR-K-AD-54
 P - *Lagerstroemia parviflora* (62.4)
 S - Nil
 I - *Terminalia arjuna* (14.3), *Lannea coromandelica* (11.3), *Schleichera oleosa* (10.6)
 M - *Careya arborea* (1.4)
 N-SR-K-AD-55
 P - *Lagerstroemia parviflora* (60.7)
 S - *Opilia amentacea* (18.7)
 I - *Terminalia arjuna* (7.4), *Lannea coromandelica* (6.2) *Schleichera oleosa* (4.0)
 M - *Careya arborea* (2.8), *Madhuca indica* (0.2)
 N-M-M-Ad-56
 P - *Lagerstroemia parviflora* (52.08)
 S - *Careya arborea* (23.83)
 I - *Terminalia arjuna* (12.25). *Lannea coromandelica* (10.09)
 M - *Schleichera oleosa* (1.75)
 N-M-M-Ad-57
 P - *Careya arborea* (45.1)
 S - *Lagerstroemia parviflora* (20.3) *Lannea coromandelica* (15.2)
 I - *Schleichera oleosa* (10.4), *Clerodendron inerme* (8.0)
 M - *Terminalia arjuna* (1.0)
 N-M-M-Ad-58
 P - Nil
 S - *Terminalia arjuna* (33.33), *Careya arborea* (21.80), *Schleichera oleosa* (20.26)
 I - *Lannea coromandelica* (10.40), *Clerodendron inerme* (7.0), *Lagerstroemia parviflora* (4.0)
 M - *Albizia lebbbeck* (1.61), *Ageratum conyzoides* (1.6)
 N-SR-K-Ad-59
 P - *Terminalia arjuna* (83.83).

PLATE-1

(Magnification X750)

1. *Croton bonplandianum*, 2. *Schleichera oleosa*, 3. *Lagerstroemia parviflora*, 4. *Lannea coromandelica*, 5. *Syzygium cumini*, 6. *Sphaeranthus indicus*, 7. *Ageratum conyzoides*, 8. *Careya arborea*, 9. *Opilia amentacea*, 10. *Terminalia arjuna*, 11. *Aegle marmelos*, 12. *Helianthus annuus*, 13. *Madhuca indica*, 14. *Peltophorum ferruginum*, 15. *Bombax ceiba*, 16. *Evolvulus alsinoides*, 17. *Albizia lebbbeck*.

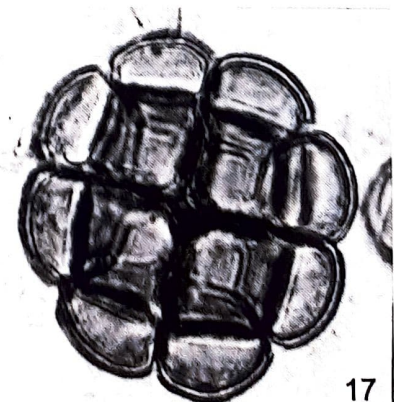
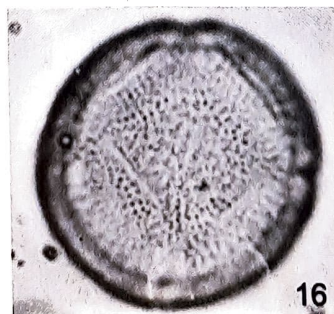
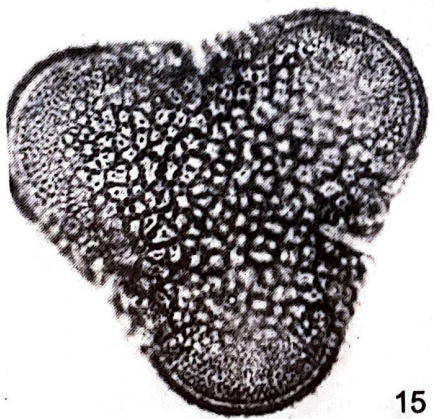
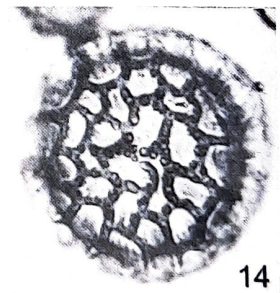
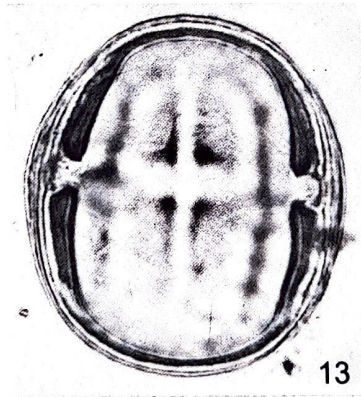
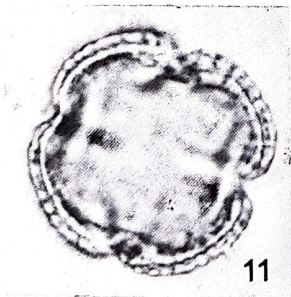
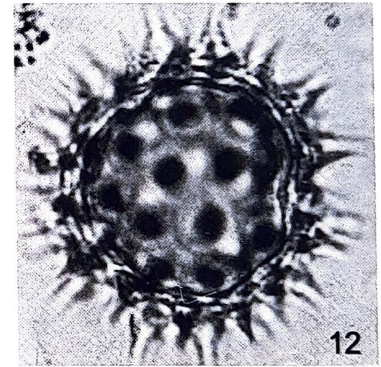
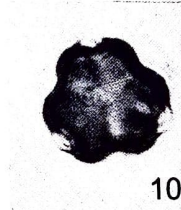
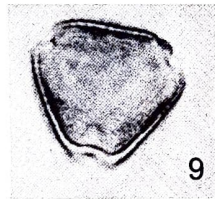
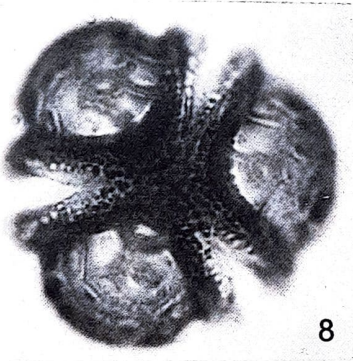
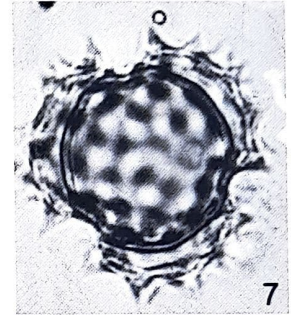
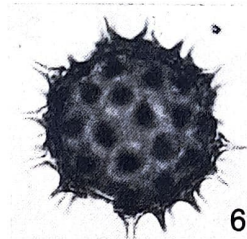
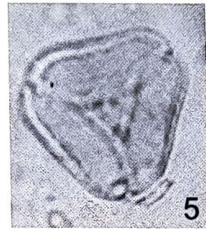
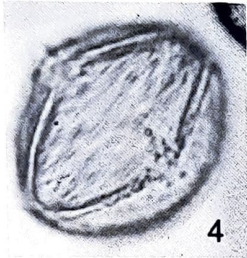
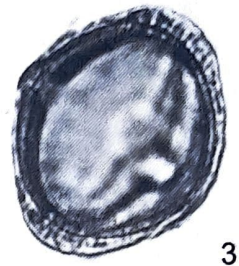
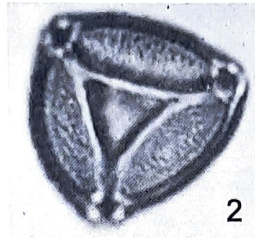
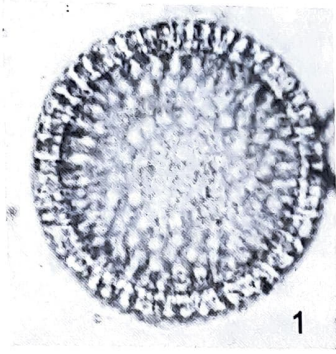


PLATE 1

GEOPHYTOLOGY

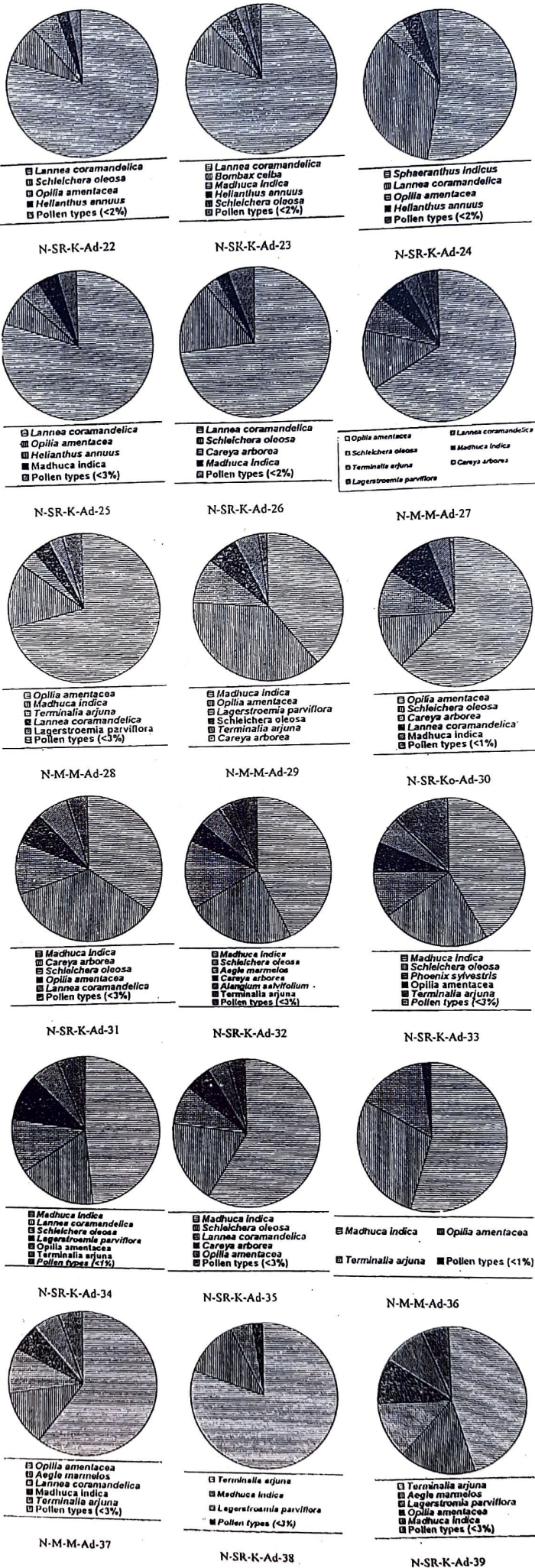


Fig. Pollen Spectra of honey samples

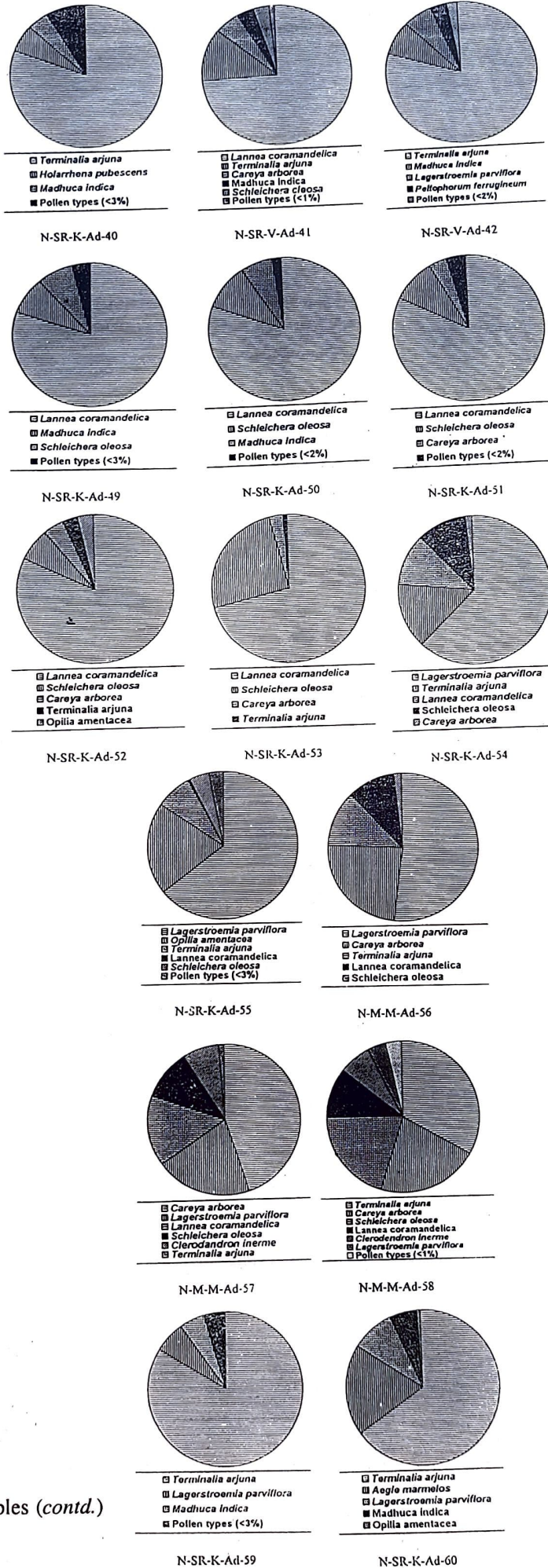


Fig. Pollen Spectra of honey samples (contd.)

- S - Nil
 I - *Lagerstroemia parviflora* (6.5), *Madhuca indica* (5.3)
 M - *Opilia amentacea* (2.78), *Clerodendron inerme* (1.0),
Ageratum conyzoides (0.59)
 N-SR-K-Ad-60
 P - *Terminalia arjuna* (65.28)
 S - *Aegle marmelos* (19.28)
 I - *Lagerstroemia parviflora* (9.17), *Madhuca indica* (5.42)
 M - *Opilia amentacea* (0.85)

DISCUSSION

The present study clearly indicates that the rock bee honeys of Machareddy and Sirikonda mandals of Nizamabad district possess strong palynological similarity with the Rangareddy, Kurnool, Mahaboobnagar and West Godavari summer honey samples (Ramanujam 1994, Ramanujam & Khatija 1992, 1995)

The pollen types of Nizamabad, viz., *Lannea coromandelica*, *Lagerstroemia parviflora*, *Careya arborea*, *Helianthus annuus*, *Ageratum conyzoides*, *Sesamum indicum*, *Aegle marmelos*, *Phoenix sylvestris*, *Syzygium cumini*, *Evolvulus alsinoides* and *Albizia lebbek* are commonly encountered in the rock bee summer honeys of Rangareddy District (Ramanujam 1994).

The common palynotypes recorded in the rock bee honey samples of Mahaboobnagar and Nizamabad districts during summer are *Lannea coromandelica*, *Terminalia arjuna*, *Madhuca indica*, *Lagerstroemia parviflora*, *Sphaeranthus indicus*, *Careya arborea*, *Schleichera oleosa*, *Bombax ceiba*, *Ageratum conyzoides*, *Aegle marmelos*, *Alangium salvifolium*, *Phoenix sylvestris*, *Syzygium cumini*, *Evolvulus alsinoides*, *Croton bonplandianum*, *Albizia lebbek* and *Sonchus oleraceus* (Ramanujam & Khatija 1995)

The pollen types of *Lannea coromandelica*, *Terminalia arjuna*, *Madhuca indica*, *Lagerstroemia parviflora*, *Sphaeranthus indicus*, *Careya arborea*, *Schleichera oleosa*, *Bombax ceiba*, *Helianthus annuus*, *Alangium salvifolium*, *Syzygium cumini*, and *Croton bonplandianum* are recorded in the hon-

eys of both Kurnool and Nizamabad districts (Ramanujam and Khatija 1995).

The pollen types of Sirikonda and Machareddy summer honeys of Nizamabad district viz., *Lannea coromandelica*, *Lagerstroemia parviflora*, *Schleichera oleosa*, *Peltophorum ferrugineum*, *Aegle marmelos* and *Croton bonplandianum* are also found to be common to summer honeys of West Godavari (Ramanujam & Khatija 1992).

Opilia amentacea and *Holarrhena pubescence* pollen were not recorded earlier in the rock bee honeys of Rangareddy, Mahaboobnagar, Kurnool and West Godavari districts.

There is a remarkable difference in the overall pollen contents of the honeys of Sirikonda and Machareddy Mandals despite their geographical proximity.

Madhuca indica, *Lagerstroemia parviflora*, *Opilia amentacea*, *Careya arborea* were common to both the mandals as predominant pollen types. *Terminalia arjuna* was predominant pollen type in Sirikonda and secondary in Machareddy. *Careya arborea* and *Schleichera oleosa* were secondary in Sirikonda but were found as predominant and secondary pollen types in Machareddy.

The pollen types of *Bombax ceiba*, *Peltophorum ferrugineum*, *Aegle marmelos*, *Phoenix sylvestris*, *Syzygium cumini*, *Helianthus annuus*, *Sesamum indicum*, *Evolvulus alsinoides*, *Croton bonplandianum*, *Sonchus oleraceus*, *Sphaeranthus indicus* and *Holarrhena pubescence* were recorded only in the honey samples of Sirikonda Mandal.

The diversity of pollen contents recorded in the honey of these two neighbouring mandals may be considered an expression of the overall floral and vegetational diversity encountered in these mandals.

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REFERENCES

- Erdtman, G 1960. The acetolysis method. A revised description. *Svens. bot.Tidskr.* **54**: 561 – 564
- Louveaux, J, Maurizio, A & Vorwohl, G 1978. Methods of Melissopalynology. *Bee World* **59**: 139–157.
- Ramanujam, CGK 1994. *Sesamum indicum* L. an important source of nectar and pollen of rock bees (*Apis dorsata* F.) in Rangareddy District, A.P., *Geophytology* **24** (1) : 155–118
- Ramanujam, CGK & Khatija, F 1992. Pollen characterization of rock bee honeys from the deciduous forest of West Godavari District, A.P. *Bull. bot. Surv. India* **34**: 1-4: 155 – 164
- Ramanujam, CGK & Khatija, F 1995. Pollen characterization of rock bee honeys from deciduous forests of Andhra Pradesh. *Vistas in Palynology, Perspectives and prospects. P.K.K. Nair Comm. Vol. J. Palynol.* **31**: 183 – 201.