

# Nectar and pollen supply for rock bees (*Apis dorsata*) from Sadasivanagar Mandal of Nizamabad district, Andhra Pradesh

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The paper deals with the nectar and pollen supply of squeezed honeys of rock bees from Sadasivanagar Mandal of Nizamabad District, Andhra Pradesh. 20 squeezed honey samples have been studied for the first time which reveals the presence of 15 unifloral and the rest multifloral types. A total of 2159 pollen loads were studied from 13 combs from 7 different villages. Of these 68.47% were found of the unifloral, 31.53% mixed loads. The predominant unifloral honeys were found to be of *Helianthus annuus*, *Brassica nigra* and *Guizotia abyssinica*. The chemical analysis of honey indicates the L/D ratio in unifloral honeys is more than 1, reflecting its less prone to granulation.

**Key-words**—Nectar and pollen supply, rock bee honeys, Nizamabad district, Andhra Pradesh.

## INTRODUCTION

*APIS dorsata* is the predominant honey producing bee among the four Indian species. Nizamabad, one of the Telangana districts of Andhra Pradesh, has vast expansion of agricultural land and discrete pockets of deciduous forests. The present study encompasses a comprehensive qualitative and quantitative analyses of the pollen contents of honeys and pollen loads of *A. dorsata* combs for evaluating the nectar and pollen sources of these bees from Sadasivanagar Mandal of Nizamabad district, Andhra Pradesh.

## MATERIAL AND METHOD

The honey samples and pollen loads of *Apis dorsata* i.e. rock bee were collected from the combs of agricultural tracts, 20 squeezed honey samples (200 grams each) were collected from Uppalwai (2), Sadasivanagar (8), Thirumalapally (2), Rangampet (2), Markal (2), Gidda (2), Mossampoor (1), Yellareddypet (1) villages, and 2159 pollen loads were obtained from *A. dorsata* combs of these bees from Uppalwai (483), Sadasivanagar (391), Thirumalapalli (362), Mosampoor (132), Rangampet (238), Gidda (203) and Markal (350) villages of Sadasivanagar Mandal of Nizamabad district during winter.

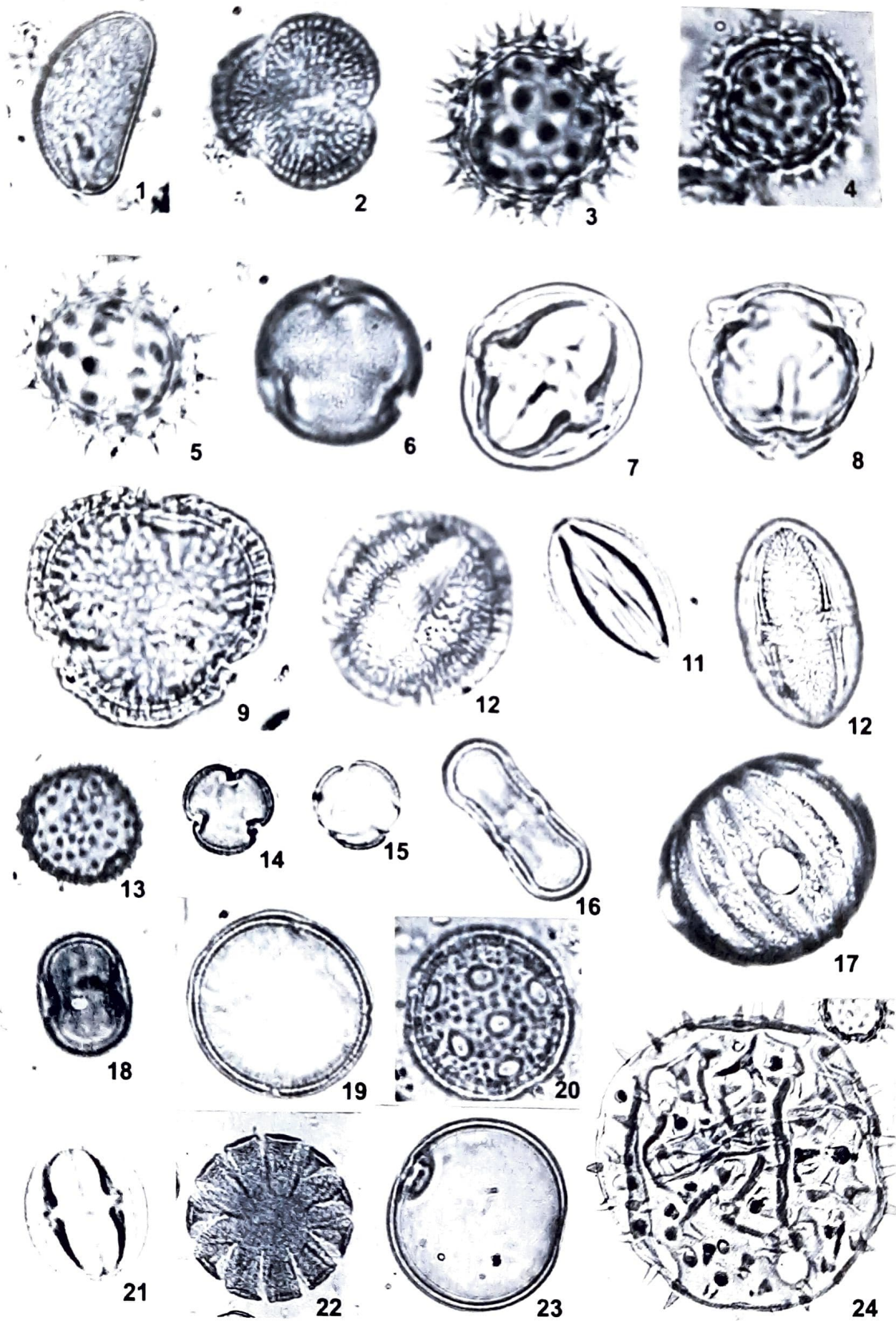
For processing, recovery, analysis and quantification of pollen contents of honeys, the methodology recommended by the International Commission for Bee Botany (Louveaus *et al.* 1978) was followed. For each sample three slides were studied critically for pollen types. The pollen types recovered were identified with the help of reference palynoslides of the local flora. The pollen grains were counted at random for determining the frequency classes as Predominant(P), Secondary(S), Important minor(I), and Minor (J) types.

The chemical analysis was carried out in accordance with the methodology recommended by IS 4941 (1974) and IS 8464 (1977). The moisture content was determined using ERMA refractometer.

## OBSERVATION

### *Pollen analysis of honeys:*

The pollen analysis of 20 honey samples was carried out which resulted in the recognition of 15 samples as unifloral viz. *Helianthus annuus* (52-70%) in 4 samples (Ad-6, 19, 20, 44), *Brassica nigra* (45.9-76.24%) in 4 samples (Ad-2, 4, 7, 11), *Guizotia abyssinica* (60.45-71.18%) (Ad. 17, 48) *Eucalyptus globulus* (46.25-63%) in 2 samples each



## PLATE - 1

(Unless otherwise mentioned all photographs  $\times 1000$ )

1. *Allium cepa* 2. *Brassica nigra*, 3. *Helianthus annuus* 4. *Tridax procumbens* 5. *Guizotia abyssinica* 6. *Ricinus* 7 & 8. *Capsicum frutescense* 9 & 10. *Euphorbia pulcherrima* 11. *Prosopis juliflora* 12. *Grewia tiliaefolia* 13. *Abutilon indicum* (x 500) 14. *Phyllanthus* sp. (x 750) 15. *Leucas aspera* (x 750) 16. *Coriandrum sativum* 17. *Asteracantha longifolia* 18. *Justicia procumbens* (x 750) 19. *Evolvulus alsinoides* 20. *Celosia argentea* 21. *Cleome viscosa* 22. *Sesamum indicum* 23. *Graminae* type 24. *Hibiscus esculentus*.

(Ad. 18,46) and *Sphaeranthus indicus* (63.31%) (Ad-21) *Grewia tiliaefolia* (48.75%) in (Ad-1) *Tridax procumbens* (52.23%) in 1 sample (Ad-43) each.

In the remaining 5 samples (Ad-3, 5, 8, 45 and 47) representing multifloral honeys. *Helianthus annuus*, *Brassica nigra*, *Capsicum frutescens*, *Coriandrum sativum*, *Guizotia abyssinica*, *Ageratum conyzoides* and *Eucalyptus globulus* constituted secondary types.

Important minor pollen types in the honey samples are *Prosopis juliflora*, *Allium cepa*, *Hibiscus esculentus* *Justicia procumbens*, *Rungia repens*, *Ocimum basilicum*, *Leucena leucocephala*, *Asteracantha longifolia*, *Cleome viscosa*, *Celosia argentia*, *Abutilon indicum*, *Ricinus communis*, *Carthamus tinctorius* *Euphorbia pulcherrima*, *Leucas aspera*, *Phyllanthus sp.*, *Lannea coromandelica*, *Phoenix sylvestris*, *Evolvulus alsinoides*, *Polygonum glabrum*, *Croton bonplandianum* and *Sonchus oleraceus*.

*Sorghum vulgare* and undetermined gramineae type are the pollen types of non-melliferous/anemophil (NHP) taxa encountered in negligible percentages.

### Frequency classes and frequencies (%) of pollen types

#### Sample No. Pollen Types with Frequencies.

##### N.S.U-Ad-1

- P - *Grewia tiliaefolia* (48.75%)  
 S - *Capsicum frutescens* (23.85%)  
*Eucalyptus globulus* (21%)  
 I - Nil  
 M - *Prosopis juliflora* (1.66%), *Allium cepa* (1.49%); *Guizotia abyssinica* (0.88%); *Hibiscus esculentus* (0.57%)  
*Justicia procumbens* (0.57%) *Rangia repens* (0.49%) *Ocimum basilicum* (0.33%) *Leucaena leucocephala* (0.24%) *Asteracantha longifolia* (0.16%)  
 NMP - *Sorghum vulgare* (0.16%)

##### N - S - U - Ad - 2

- P - *Brassica nigra* (76.24%)  
 S - Nil  
 I- *Allium cepa* (4.66%); *Guizotia abyssinica* (4.56%) *Ocimum basilicum frutescens* (1.24%) *Ageratum conyzoides* (0.74%), *Rungia repens* (0.66%) *Justicia procumbens* (0.59%); *Coriandrum sativum* (0.51%), *Grewia tiliaefolia* (0.47%), *Celosia argentia* (0.44%), *Asteracantha longifolia* (0.4%), *Abutilon indicum* (0.18%)  
 NMP- *Sorghum vulgare* (0.16%)

##### N - S - S - Ad - 3

- P- Nil  
 S- *Helianthus annuus* (39.3%), *Brassica nigra* (26.74%)  
 I- *Eucalyptus globulus* (14.58%), *Tridax procumbens* (12.44%), *Allium cepa* (3.33%).  
 M- *Grewia tiliaefolia* (1.18%), *Rungia repens* (1.17%), *Ocimum basilicum* (0.68%), *Ageratum conyzoides* (0.58%).  
 NMP- *Sorghum vulgare* (7.56%)

##### N - S - Th - Ad - 4

- P- *Brassica nigra* (70.41%)  
 S- Nil  
 I- *Coriandrum sativum* (15.28%), *Capsicum frutescens* (6.84%), *Eucalyptus globulus* (4.8%)  
 M- *Helianthus annuus* (1.67%), *Ageratum conyzoides* (1.0%)

##### N - S - M - Ad - 5

- P- Nil  
 S- *Capsicum frutescens* (41.58%), *Brassica nigra* (39.87%)  
 I- *Coriandrum sativum* (7.44%), *Helianthus annuus* (4.8%)

M- *Eucalyptus globulus* (2.16%),  
*Grewia tiliaefolia* (2.08%), *Rungia repens* (1.08%), *Ageratum conyzoides* (0.66%), *Asteracantha longifolia* (0.33%)

NMP- Nil

#### N - S - Th - Ad - 6

P- *Helianthus annuus* (65.3%)

S- Nil

I- *Capsicum frutescens* (13.58%),  
*Guizotia abyssinica* (12.04%),  
*Brassica nigra* (4.49%)

M- *Eucalyptus globulus* (2.83%),  
*Grewia tiliaefolia* (0.88%), *Hibiscus esculentus* (0.88%)

NMP- *Sorghum vulgare* (0.58%)

#### N - S - R - Ad - 7

P- *Brassica nigra* (45.9%)

S- *Coriandrum sativum* (24.6%),  
*Guizotia abyssinica* (23.0%)

I- Nil

M- *Prosopis juliflora* (1.83%),  
*Eucalyptus globulus* (1.74%),  
*Capsicum frutescens* (0.83%),  
*Rungia repens* (0.745)

*Ageratum conyzoides* (0.46%),  
*Euphorbia pulcherrima* (0.42%),  
*Ricinus communis* (0.24%), *Grewia tiliaefolia* (0.165), *Asteracantha longifolia* (0.08%).

#### N - S - R - Ad - 8

P- Nil

S- *Brassica nigra* (41.05%),  
*Coriandrum sativum* (35.0%)

I- *Guizotia abyssinica* (8.92%),  
*Eucalyptus globulus* (6.83%),  
*Helianthus annuus* (5.49%)

M- *Carthamus tinctorius* (1.16%),  
*Capsicum frutescens* (0.49%),  
*Grewia tiliaefolia* (0.31%),

*Euphorbia pulcherrima* (0.33%),  
*Ageratum conyzoides* (0.26%),  
*Rungia repens* (0.16%).

#### N - S - E - Ad - 11

P- *Brassica nigra* (49.49%)

S- *Coriandrum sativum* (25.41%),  
*Helianthus annuus* (21.08%)

I- *Eucalyptus globulus* (3.24%)

M- *Prosopis juliflora* (0.78%)

#### N - S - M - Ad - 17

P- *Guizotia abyssinica* (60.45%)

S - *Phoenix sylvestris* (25.23%)

I- *Ricinus communis* (5.74%), *Allium cepa* (3.08%)

M- *Euphorbia pulcherrima* (2.16%),  
*Brassica nigra* 91.58%), *Rungia repens* (0.66%)

*Ageratum conyzoides* (0.41%),  
*Coriandrum sativum* (0.405%),  
*Eucalyptus globulus* (0.29%)

NMP- *Sorghum vulgare* (0.25%)

#### N - S - M - Ad - 18

P- *Eucalyptus globulus* (63.00%)

S- *Guizotia abyssinica* (22.00%)

I- *Brassica nigra* (4.5%), *Carthamus tinctorius* (3.00%)

M- *Coriandrum sativum* (2.3%),  
*Ricinus communis* (1.4%),  
*Ageratum conyzoides* (1.2%),  
*Leucas aspera* (1.0%), *Phoenix sylvestris* (0.9%), *Rungia repens* (0.7%)

NMP- *Sorghum vulgare* (0.3%)

#### N - S - S - Ad - 19

P- *Helianthus annuus* (70.0%)

S- *Guizotia abyssinica* (16.34%)

I- *Brassica nigra* (8.33%)

M- *Coriandrum sativum* (1.28%),  
*Ocimum basilicum* (1.07%),

*Carthamus tinctorius* (0.78%),  
*Justicia procumbens* (0.66%),  
*Grewia tiliaefolia* (0.63%), *Rungia*  
*repens* (0.5%), *Sphaeranthus indicus*  
 (0.41%)

NMP- *Sorghum vulgare* (0.33%)

#### N - S - G - Ad - 20

P- *Helianthus annuus* (52.0%)

S- *Sphaeranthus indicus* (41.07%)

I- Nil

M- *Phyllanthus sp.* (1.64%), *Capsicum*  
*frutescens* (1.4%), *Sonchus*  
*oleraceus* (1.0%), *Lannea*  
*coromandelica* (0.9%) *Brassica*  
*nigra* (0.71%), *Phoenix sylvestris*  
 (0.69%)

NMP- *Sorghum vulgare* (0.66%)

#### N - S - G - Ad - 21

P- *Sphaeranthus indicus* (63.31%)

S- *Lannea coromandelica* (23.83%)

I- *Helianthus annuus* (11.06%)

M- *Capsicum frutescens* (1.02%),  
*Grewia sp.* (0.78%)

NMP- *Sorghum vulgare* (0.45%)

#### N - S - S - Ad - 43

P- *Tridax procumbens* (52.23%)

S- *Helianthus annuus* (28.36%)

I- *Capsicum rutescens* (8.0%), *Allium*  
*cepa* (6.83%), *Eucalyptus globulus*  
 (4.58%)

M- Nil

NMP- *Sorghum vulgare* (0.78%)

#### N - S - S - Ad - 44

P- *Helianthus annuus* (56.1%)

S- *Allium cepa* (22.24%)

I- *Eucalyptus globulus* (12.57%),  
*Guizotia abyssinica* (5.52%)

M- *Ageratum conyzoides* (2.26%),  
*Celosia argentea* (1.31%)

NMP- *Graminae* (0.52%)

#### N - S - S Ad - 45

P- Nil

S- *Guizotia abyssinica* (27.28%),  
*Helianthus annuus* (22.46%)

*Ageratum conyzoides* (20.48%)

I- *Capsicum frutescens* (14.08%),  
*Eucalyptus globulus* (14.02%)

M- *Evolvulus alsinoides* (0.79%),  
*Allium cepa* (0.5%), *Polygonum*  
*glabrum* (0.39%).

#### N - S - S - Ad - 46

P- *Eucalyptus globulus* (46.25%)

S- *Guizotia abyssinica* (16.20%)

I- *Euphorbia pulcherrima* (8.0%),  
*Allium cepa* (7.25%)

*Helianthus annuus* (6.73%),  
*Brassica nigra* (5.02%)

*Celosia argentea* (4.04%)

M- *Polygonum glabrum* (2.13%),  
*Capsicum frutescens* (2.03%),  
*Abutilon indisum* (0.91%),  
*Evolvulus alsinoides* (0.8%), *Croton*  
*bonplandianum* (0.64%)

#### N - S - S - Ad - 47

P- Nil

S- *Guizotia abyssinica* (33.64%),  
*Eucalyptus globulus* (32.82%)

I- *Allium cepa* (13.94%), *Brassica*  
*nigra* (5.76%),

*Euphorbia pulcherrima* (4.0%)

M- *Capsicum frutescens* (3.0%),  
*Ocimum basilicum* (2.4%),  
*Polygonum glabrum* (2.0%),  
*Celosia argentea* (1.80%), *Hibiscus*  
*esculentus* (0.64%).

#### N - S - S - Ad - 48

P- *Guizotia abyssinica* (71.18%)

S- Nil

- I- *Eucalyptus globulus* (15.0%), (5.41%) for gramineae, 75 (5.1%) for *Eucalyptus globulus*, 69 (4.67%) for *Sphaeranthus indicus*, 62 (4.17%) for *Phoenix sylvestris*, 53 (3.58%) for *Allium cepa*, 37 (2.5%) for *Lannea coromandelica*, 36 (2.43%) for *Coriandrum sativum*, 34 (2.3%) for *Grewia tiliaefolia* and the remaining pollen types i.e. *Tridax procumbens*, *Ricinus communis*, *Prosopis juliflora*, *Ageratum conyzoides*, *Ocimum basilicum*, *Carthamus tinctorius*, *Justicia procumbens*, *Asteracantha longifolia* and Malvaceae type were recorded less than 2% each.
- M- *Ocimum basilicum* 91.72%), *Capsicum frutescens* (1.5%)  
*Cleome viscosa* (0.8%), *Celosia argentea* (0.7%)

### Pollen analysis of pollen loads:

A total of 2159 pollen loads were collected from 13 combs (Ad 1, 2, 3, 4, 5, 6, 7, 8, 17, 18, 21, 44 and 47) of 7 different villages of Sadasivanagar Mandal, of these, 1477 (68.47%) were found to be unifloral and 682 (31.53%) mixed loads could be recognized in the present study, one with 2 and the other with 3 or 4 pollen types. The former is represented by 598 (27.33%) and the latter by 84 (3.8%) loads.

Of the 1477 unifloral loads, 455 (30.86%) were unifloral for *Helianthus annuus*, 215 (14.55%) for *Guizotia abyssinica*, 157 (10.63%) for *Brassica nigra*, 101 (6.84%) for *Capsicum frutescens*, 80

The following pollen types are recorded from the 598 bifloral loads viz., *Brassica nigra*, *Celosia argentea*, *Guizotia abyssinica*, *Helianthus annuus*, *Tridax procumbens*, *Allium cepa*, *Capsicum frutescens*, *Eucalyptus globulus*, *Coriandrum sativum*, *Phoenix sylvestris*, *Sphaeranthus indicus*, *Ricinus communis*, *Lannea coromandelica*, *Grewia tiliaefolia*, Malvaceae type, *Prosopis juliflora*, *Ageratum conyzoides*, *Ocimum basilicum*, *Rungia repens*, *Carthamus tinctorius*, *Asteracantha longifolia* and *Euphorbia pulcherrima*.

**Table-I. Chemical analysis of 6 different unifloral honeys.**

Sl. No.	Sample No.	Total Reducing Sugars	Levulose/ Fructose	Dextrose (D) glucose %	L/D Ratio	Sucrose %	Moisture %	Acidity
1.	N-S-U-Ad-1 <i>Grewia tiliaefolia</i> Unifloral honey	75.14	40.25	35.89	1.53	1.94	21.2	0.0521
2.	N-S-U-Ad-2 <i>Brassica nigra</i> Unifloral honey	76.01	40.12	35.8	1.117	1.392	22.12	0.0435
3.	N-S-U-Ad-6 <i>Helianthus annus</i> Unifloral honey	72.126	40.824	31.302	1.304	2.126	21.92	0.0315
4.	N-S-M-Ad-17 <i>Guizotia abyssinica</i> Unifloral honey	76.852	40.548	36.304	1.116	0.961	20.54	0.053
5.	N-S-M-Ad-18 <i>Eucalyptus globulus</i> Unifloral honey	72.933	40.543	32.39	1.252	1.796	20.9	0.0483
6.	N-S-G-Ad-21 <i>Sphaeranthus indicus</i> unifloral honey	78.868	45.55	33.318	1.367	0.811	20.1	0.0745

The multifloral pollen loads \*82) were represented by *Brassica nigra*, *Guizotia abyssinica*, *Allium cepa*, *Helianthus annuus*, *Coriandrum sativum*, *Justicia procumbens*, *Ricinus communis*, *Phoenix sylvestris*, *Grewia tiliaefolia*, *Eucalyptus globulus*, *Capsicum frutescens*, *Malvaceae type*, *Celosia argentea*, *Ocimum basilicum*, *Rungia repens*, *Prosopis juliflora*, *Lannea coromandelica*, *Sphaeranthus indicus*, *Asteracantha longifolia*, *Tridax procumbens* and *Ageratum conyzoides*.

### DISCUSSION

The present study has brought to light the unifloral honeys of *Helianthus annuus*, *Brassica nigra* and *Guizotia abyssinica* from Sadasivanagar mandal. All these 3 taxa represent important crop plants of this area. Among the pollen loads too these three crops contributed the lionshare. In this context there is a striking similarity with the honeys studied from Rangareddy, West Godavari, Kurnool and Mahaboobnagar Districts of A.P. (Ramanujam, 1994, Ramanujam & Khatija, 1992, 1995).

The record of unifloral honey of *Grewia tiliaefolia* highlights the proximity of forest vegetation to the site of collection of honeys.

The percentages of total reducing sugars were found to range from 72.126 (Ad-6) to 78.868 (Ad-21), Levulose or Fructose percentage ranged from

40.12 (Ad-2) to 45.55 (Ad-21) and Dextrose or Glucose percentage ranged from 31.302 (Ad-6) to 36.304 (Ad-17) Levulose, Dextrose ratio ranged from 1.116 (Ad-17) to 1.252 (Ad-18). Levulose is higher in percentage in these honeys in comparison to Dextrose. The L/D ratio in all the honeys is more than 1, indicating that these honeys seldom granulate.

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