

***Carum copticum* - A Major Source of Winter Honeys in Ranga Reddy District, Andhra Pradesh**

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Pollen analysis of 57 winter honey samples (47 of *Apis florea* and 10 of *A. dorsata*) obtained from the agricultural tracts of 8 mandals of Ranga Reddy district, Andhra Pradesh was carried out. The study has shown that *Carum copticum* furnished the major and, *Guizotia abyssinica*, *Coriandrum sativum*, *Mangifera indica* and *Ageratum conyzoides*, the reliable sources of nectar for the honey bees of this district during winter season.

Key Words : *Carum copticum*, Nectar source, Honeys, Ranga Reddy district, Pollen analysis

Introduction

The accredited and universally recognized attribute of the honey bees involving their floral fidelity and conditioning to a particular species for their nectar and pollen requirements is responsible for the production of single source or unifloral honeys. Different unifloral honeys have characteristic taste, flavour and colour because of subtle differences and variations in their overall chemical composition, providing thereby a high degree of choice to discerning connoisseurs of honey consumption. A detailed melittopalynological study of the agricultural tracts and deciduous forests of Ranga Reddy district in Andhra Pradesh, undertaken by the authors since 1988 has brought to light a number of seasonal unifloral honeys. Most of the honey produced in this district is harvested from the natural and wild colonies of *Apis dorsata* Fab. (Rock bees) and *A. florea* Fab. (Small bees). In their earlier publications, the authors recognized a few unifloral honeys of *Carum copticum* Benth. & Hook. f,

Guizotia abyssinica Cass., *Ailanthus excelsa* Roxb. (Kalpana & Ramanujam 1989, 1991), *Prosopis juliflora* (Sw.) DC. and *Tamarindus indica* L. (Ramanujam & Kalpana 1990-91, 1992) of *A. florea* bees from this district. The main objective of the present investigation is to recognize and highlight *Carum copticum* as the major source of nectar for the production of winter honeys by *A. dorsata* and *A. florea* bees in and around the agricultural tracts of Ranga Reddy district.

Materials and Methods

Fifty seven samples (47 of *A. florea* and 10 of *A. dorsata*) were collected from the agricultural tracts of eight contiguous mandals of Ranga Reddy district (figure 1) during November – February of 1988-93. All these samples represent squeezed honeys obtained to the extent possible from the honey storing portions of the combs. Table 1 provides data on the inventory of the honey samples. The qualitative analysis of the

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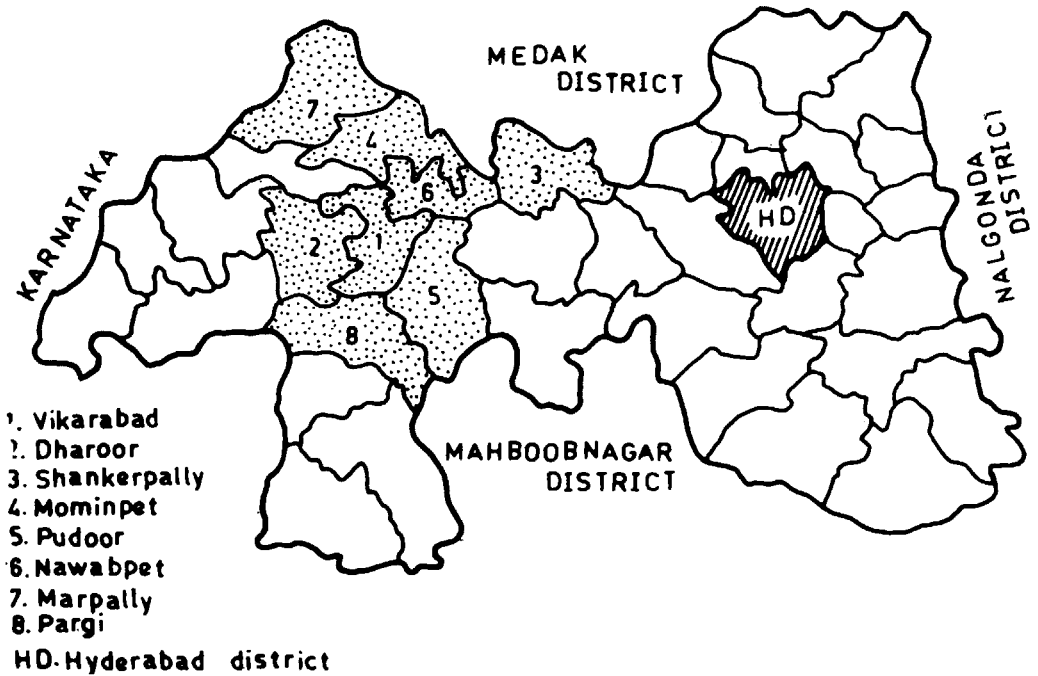


Figure 1 Location sites of honey samples

pollen contents of honeys and their quantification was carried out in accordance with the methodology recommended by the International Commission for Bee Botany (Louveaux et al. 1978). The pollen types recovered were identified with the help of reference slide preparations of the polleniferous material from the local floras.

Results

Of the 57 honey samples studied, as many as 51 (89.47%) were found to be unifloral and the rest (6) multifloral. *Carum copticum* (Apiaceae) honeys constitute the bulk of the unifloral honeys as evidenced by the predominant pollen types referable to this taxon in 32 (62.75%) unifloral honeys. All the eight mandals which provided samples for this study showed unifloral *Carum* honeys. Of the remaining 19 unifloral honeys, 7

are represented by *Guizotia abyssinica* (Asteraceae); 4 by *Coriandrum sativum* L. (Apiaceae); 2 each by *Mangifera indica* L. (Anacardiaceae), *Ageratum conyzoides* L. (Asteraceae); 1 each by *Capsicum frutescens* L. (Solanaceae), *Sphaeranthus indicus* L. (Asteraceae) and *Ailanthus excelsa* (Simaroubaceae) and *Allium cepa* L. (Liliaceae) (table 1). Figure 2 depicts the numerical representation of the various types of unifloral winter honeys recorded. The secondary pollen types encountered only in some of the honeys were represented by *Guizotia abyssinica*, *Tridax procumbens* L., *Sphaeranthus indicus*, *Ageratum conyzoides* (Asteraceae); *Justicia procumbens* L., *Rungia repens* (L.) Nees. (Acanthaceae); *Capsicum frutescens*, *Mangifera indica*, *Dodonaea vis-*

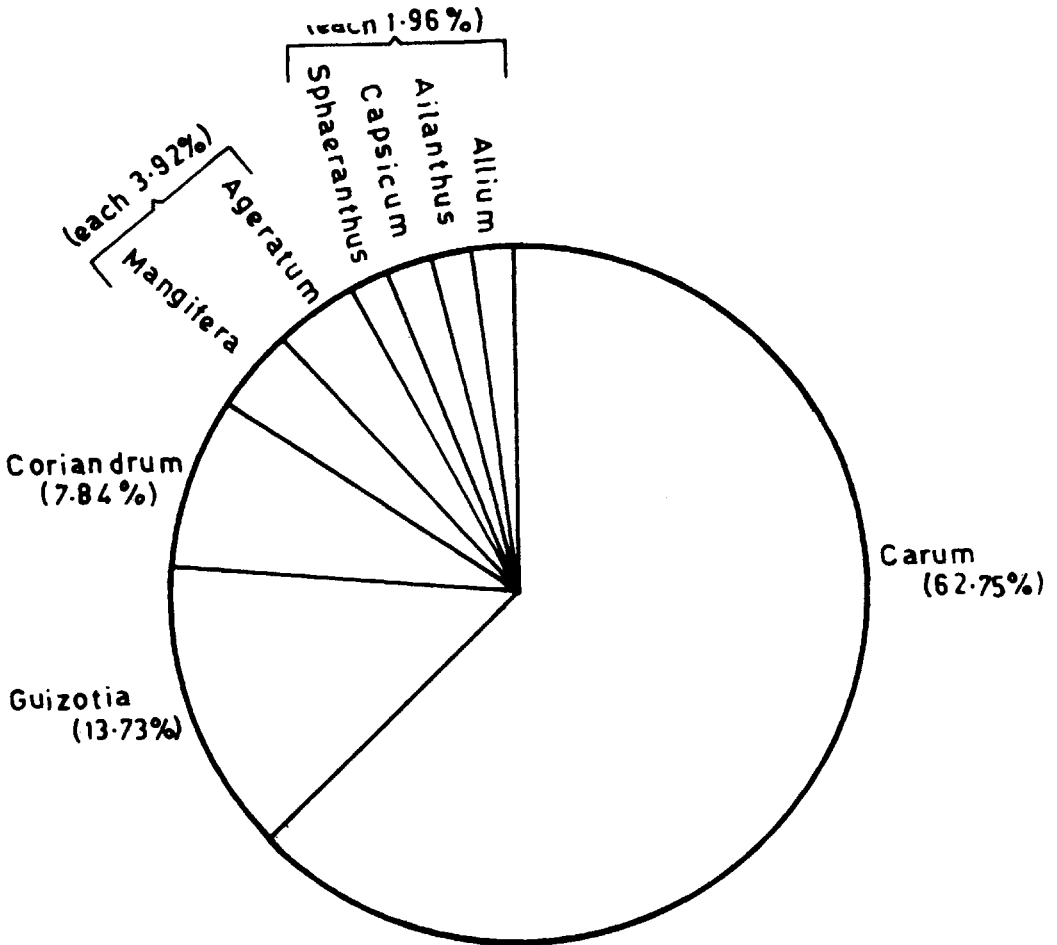


Figure 2 Numerical representation of various types of unifloral winter honeys

cosa (L.) Jacq. (Sapindaceae); *Cajanus cajan* (L.) Millsp. (Papilionaceae); *Cleome gynandra* L. (Capparidaceae) and *Carum copticum*. These taxa are of great importance for describing pollen profiles of the honeys of the area. The study further brought to light a good number of taxa viz., *Buchanania lanzan* Spreng., *Brassica nigra* (L.) Koch., *Ricinus communis* L., *Leucas aspera* Spreng., *Eucalyptus* sp., *Carthamus tinctorius* L., *Cucumis* sp., *Phoenix sylvestris* (L.) Roxb., *Psidium guajava* L., *Helianthus annuus* L., *Tinospora cordifolia* (Willd.) Miers.

ex HK.f & Thoms., *Mollugo cerviana* (L.) Ser., *Lepidagathis cristata* Willd., *Prosopis juliflora*, *Celosia argentea* L., *Acacia nilotica* (L.) Willd. ex Del., *Sopubia delphinifolia* (Roxb.) G. Don. and *Triumfetta rhomboidea* Jacq. usually encountered in the floristic complex of the agricultural tracts of Ranga Reddy district providing limited source of nectar to the winter honeys of *A. florea* and *A. dorsata* bees. The pollen of these taxa constitute important minor types in the honeys. Table 1 provides the details of the frequency classes and frequencies (%) of

Table 1 Frequency classes and frequencies (%) of pollen types in honey samples

Sample No.	Mandal	Village	Month of collection	Nature of honey & % of predominant pollen	Associated pollen types (up to important minor types only)
RR-V-D-21a	Vikarabad	Dhannaram	Jan. 1989	Unifloral (<i>Carum</i> -77.67)	I- <i>Guizotia</i> (4.0), <i>Tridax</i> (3.33)
RR-V-D-21b	"	"	Feb. 1990	Unifloral (<i>Mangifera</i> -54.0)	I- <i>Buchanania</i> (14.67), <i>Cleome</i> (11.67), <i>Sphaeranthus</i> (3.67), <i>Allium</i> , <i>Ageratum</i> (each 3.0)
RR-V-K-22a	"	Kottagadi	Dec. 1988	Unifloral (<i>Carum</i> - 63.33)	I- <i>Ageratum</i> (9.67), <i>Sphaeranthus</i> , <i>Brassica</i> (each 8.0)
RR-V-A-50a	"	Ananthagripalli	Nov. 1989	Multifloral No predominant pollen	S- <i>Sphaeranthus</i> (42.33), <i>Guizotia</i> (28.33) I- <i>Tridax</i> (10.33), <i>Carum</i> (6.0), <i>Ageratum</i> (4.33), <i>Justicia</i> (3.0)
RR-V-A-50b	"	"	"	Multifloral No predominant pollen	S- <i>Guizotia</i> (34.67), <i>Sphaeranthus</i> (24.0), <i>Tridax</i> (23.33) I- <i>Carum</i> , <i>Ricinus</i> , <i>Ageratum</i> (each 3.0)
RR-V-A-50c	"	"	"	Multifloral No predominant pollen	S- <i>Justicia</i> (24.33), <i>Ageratum</i> (19.0), <i>Guizotia</i> (16.0) I- <i>Sphaeranthus</i> (10.33), <i>Tridax</i> (9.0), <i>Allium</i> (3.33), <i>Capsicum</i> (3.0)
RR-V-A-50d	"	"	"	Multifloral No predominant pollen	S- <i>Ageratum</i> (40.67), <i>Carum</i> (31.33) I- <i>Guizotia</i> (4.67), <i>Tridax</i> (4.33), <i>Justicia</i> (3.67), <i>Ricinus</i> (3.33), <i>Sphaeranthus</i> (3.0)
RR-V-A-51a	"	Aalampalli	"	Multifloral No predominant pollen	S- <i>Ageratum</i> (43.33), <i>Carum</i> (27.67) I- <i>Guizotia</i> (6.0), <i>Tridax</i> (4.67), <i>Leucas</i> , <i>Ricinus</i> (each 3.33), <i>Cajanus</i> (3.0)
RR-V-A-51b	"	"	"	Unifloral (<i>Carum</i> -59.33)	I- <i>Guizotia</i> (13.0), <i>Tridax</i> (8.67), <i>Cajanus</i> (6.67), <i>Sphaeranthus</i> (4.67)

(Contd...)

(Table 1 — Contd.)

Sample No.	Mandal	Village	Month of collection	Nature of honey & % of predominant pollen	Associated pollen types (up to important minor types only)
RR-V-K-61a	"	Kompalli	Jan. 1990	Unifloral (Carum-71.33)	I-Sphaeranthus (9.67), <i>Tridax</i> (6.67), <i>Mangifera</i> (4.33)
RR-V-B-AD-4*	"	Basaram	Dec. 1992	Unifloral (Carum-79.67)	I-Guizotia (10.0), <i>Capsicum</i> (3.33), <i>Ricinus</i> (3.0)
RR-V-B-AD-5*	"	"	"	Unifloral (Carum-68.0)	S- <i>Capsicum</i> (20.33) I- <i>Eucalyptus</i> (6.0)
RR-V-B-AD-6*	"	"	"	Unifloral (Carum-55.0)	S- <i>Capsicum</i> (16.0) I- <i>Carthamus</i> (14.33), <i>Eucalyptus</i> (12.33)
RR-V-A-AD-7*	"	Ananthagiripalli	"	Unifloral (<i>Capsicum</i> -59.67)	S- <i>Carum</i> (23.67) I- <i>Eucalyptus</i> (7.0), <i>Carthamus</i> (4.33)
RR-V-A-AD-8*	"	"	"	Unifloral (<i>Guizotia</i> -66.67)	S- <i>Capsicum</i> (20.33) I- <i>Ricinus</i> (5.0), <i>Carum</i> (3.33)
RR-V-A-AD-9*	"	"	"	Unifloral (Carum-65.0)	I- <i>Capsicum</i> (14.0), <i>Guizotia</i> (13.33)
RR-D-D-1a	Dharoor	Dharoor	Dec. 1988	Unifloral (Carum-56.33)	S- <i>Guizotia</i> (37.67)
RR-D-K-2a	"	Keralli	Jan. 1989	Unifloral (Carum-79.33)	I- <i>Brassica</i> (9.67), <i>Mangifera</i> (5.67)
RR-D-N-3a	"	Nagasamundar	"	Unifloral (Carum-73.67)	I - <i>Cucumis</i> (5.0), <i>Justicia</i> (4.0)

(Contd...)

(Table 1 — Contd.)

Sample No.	Mandal	Village	Month of collection	Nature of honey & % of predominant pollen	Associated pollen types (up to important minor types only)
RR-D-R-4a	"	Rudraram	"	Unifloral (<i>Guizotia</i> -63.33)	I- <i>Carum</i> (13.67), <i>Justicia</i> (10.67), <i>Phoenix</i> (5.0), <i>Mangifera</i> (4.0)
RR-D-E-59a	"	Eabbanur	Jan. 1990	Unifloral (<i>Mangifera</i> -69.67)	I- <i>Carum</i> (14.33), <i>Cleome</i> (6.33), <i>Buchanania</i> (5.0)
RR-D-E-59b	"	"	"	Unifloral (<i>Ageratum</i> -61.0)	S- <i>Mangifera</i> (17.0) I- <i>Psidium</i> (5.0), <i>Carum</i> (4.33), <i>Guizotia</i> (3.67), <i>Buchanania</i> (3.0)
RR-D-E-59c	"	"	"	Unifloral (<i>Carum</i> -62.67)	I- <i>Mangifera</i> (13.0), <i>Guizotia</i> (5.67), <i>Ricinus</i> (4.33), <i>Ailanthus</i> (3.33), <i>Justicia</i> (3.0)
RR-D-T-AD-1*	"	Timmanagaram	Dec. 1992	Unifloral (<i>Carum</i> -73.67)	I- <i>Eucalyptus</i> (7.0), <i>Carthamus</i> (4.33), <i>Helianthus</i> (3.0)
RR-D-A-AD-2*	"	Auspally	"	Unifloral (<i>Carum</i> -60.0)	I- <i>Guizotia</i> (12.33), <i>Eucalyptus</i> (10.0), <i>Helianthus</i> (7.67), <i>Tinospora</i> (7.33)
RR-D-D-AD-3*	"	Dharoor	"	Unifloral (<i>Carum</i> -61.33)	S- <i>Dodonaea</i> (18.0) I- <i>Guizotia</i> (10.0), <i>Eucalyptus</i> (4.67)
RR-D-T-AD-10*	"	Timmanagaram	Jan. 1993	Unifloral (<i>Carum</i> -56.67)	S- <i>Cajanus</i> (18.33) I- <i>Tridax</i> (12.0), <i>Mollugo</i> (5.0)
RR-S-D-16a	Shankerpally	Dhobipet	Dec. 1988	Unifloral (<i>Coriandrum</i> -58.0)	S- <i>Carum</i> (31.33)
RR-S-D-16b	"	"	"	Unifloral (<i>Sphaeranthus</i> -57.33)	I- <i>Carum</i> (8.67), <i>Cajanus</i> (6.33), <i>Brassica</i> (4.33), <i>Tridax</i> , <i>Carthamus</i> (each 3.33)

(Contd...)

(Table 1 — Contd.)

Sample No.	Mandal	Village	Month of collection	Nature of honey & % of predominant pollen	Associated pollen types (up to important minor types only)
RR-S-D-16c	"	"	Nov. 1989	Unifloral (<i>Coriandrum</i> -58.33)	S- <i>Carum</i> (15.67) I- <i>Lepidagathis</i> (7.33), <i>Ricinus</i> (3.0)
RR-S-D-16d	"	"	"	Unifloral (<i>Coriandrum</i> -53.0)	S- <i>Carum</i> (20.0) I- <i>Ageratum</i> (13.67), <i>Ricinus</i> (5.33)
RR-S-E-17a	"	Ervaguda	Jan. 1989	Unifloral (<i>Carum</i> -75.67)	I- <i>Capsicum</i> (7.0), <i>Sphaeranthus</i> (6.33)
RR-S-E-17b	"	"	Jan. 1990	Unifloral (<i>Carum</i> -66.33)	I- <i>Coriandrum</i> (8.67), <i>Capsicum</i> (5.67), <i>Tridax</i> (5.33), <i>Sphaeranthus</i> (5.0)
RR-S-M-66a	"	Mokilaa	Feb. 1990	Unifloral (<i>Ageratum</i> -54.33)	S- <i>Tridax</i> (18.67) I- <i>Prosopis</i> (4.67), <i>Sphaeranthus</i> (3.67), <i>Capsicum</i> , <i>Ricinus</i> , <i>Carum</i> (each 3.0)
RR-S-M-67b	"	Mekhanguda	Dec. 1989	Unifloral (<i>Carum</i> -67.67)	I- <i>Ageratum</i> (7.0), <i>Sphaeranthus</i> (6.67), <i>Coriandrum</i> (4.33), <i>Helianthus</i> (3.0)
RR-M-C-39a	Mominpet	Cheemaladaari	Dec. 1988	Unifloral (<i>Guizotia</i> -47.33)	I- <i>Tridax</i> (11.67), <i>Carum</i> (8.0), <i>Capsicum</i> (7.33), <i>Celostia</i> (7.0), <i>Justicia</i> (5.0), <i>Sphaeranthus</i> (3.0)
RR-M-C-39b	"	"	Nov. 1989	Unifloral (<i>Guizotia</i> -48.0)	I- <i>Tridax</i> (13.33), <i>Allium</i> (8.33), <i>Carum</i> (7.67), <i>Justicia</i> (6.67), <i>Capsicum</i> (3.67), <i>Sphaeranthus</i> (3.0)
RR-M-C-39c	"	"	"	Unifloral (<i>Carum</i> -75.33)	I- <i>Acacia</i> (8.0), <i>Prosopis</i> (5.0)

(Contd...)

(Table 1 — Contd.)

Sample No.	Mandal	Village	Month of collection	Nature of honey & % of predominant pollen	Associated pollen types (up to important minor types only)
RR-M-C-39d	"	"	"	Unifloral (<i>Guizotia</i> -67.33)	I- <i>Carum</i> (7.67), <i>Ricinus</i> (5.67), <i>Coriandrum</i> (3.67), <i>Brassica</i> (3.0)
RR-M-E-40a	"	Enkathala	Dec. 1988	Unifloral (<i>Allium</i> -52.0)	S- <i>Justicia</i> (37.67) I- <i>Guizotia</i> (6.67)
RR-M-B-49a	"	Balareddygudem	Nov. 1989	Unifloral (<i>Guizotia</i> -50.67)	S- <i>Rungia</i> (24.0) I- <i>Capsicum</i> (10.33), <i>Carum</i> (6.33), <i>Ageratum</i> (3.33)
RR-P-G-9a	Pudoor	Gangupalli	Jan. 1989	Unifloral (<i>Carum</i> -50.67)	S- <i>Sphaeranthus</i> (21.0) I- <i>Tridax</i> (11.0), <i>Justicia</i> (9.67)
RR-P-G-9b	"	"	Nov. 1989	Unifloral (<i>Carum</i> -46.33)	S- <i>Tridax</i> (18.67) I- <i>Justicia</i> (7.33), <i>Mangifera</i> (6.67), <i>Eucalyptus</i> (3.0)
RR-P-P-10a	"	Pudoor	Nov. 1988	Unifloral (<i>Carum</i> -83.0)	I- <i>Sphaeranthus</i> (7.67), <i>Leucas</i> (4.67)
RR-P-P-10b	"	"	Jan. 1990	Unifloral (<i>Carum</i> -47.67)	S- <i>Sphaeranthus</i> (18.0) I- <i>Ageratum</i> , <i>Eucalyptus</i> (each 8.0), <i>Justicia</i> (7.33), <i>Guizotia</i> (6.33)
RR-P-R-11a	"	Rachamcherla	Dec. 1988	Unifloral (<i>Carum</i> -53.67)	S- <i>Tridax</i> (20.0) I- <i>Guizotia</i> (5.33), <i>Sphaeranthus</i> (3.67), <i>Capsicum</i> (3.0)
RR-N-E-5a	Nawabpet	Ekmameedi	Jan. 1989	Unifloral (<i>Carum</i> -85.33)	

(Contd...)

(Table 1 — Contd.)

Sample No.	Mandal	Village	Month of collection	Nature of honey & % of predominant pollen	Associated pollen types (up to important minor-types only)
RR-N-M-6a	"	Mythapkhanguada	Dec. 1988	Unifloral (Carum- 73.67)	I-Coriandrum (13.33), Capsicum (3.33)
RR-N-M-6b	"	"	Jan. 1990	Unifloral (Guizotia-60.67)	S-Carum (18.67) I-Capsicum (4.33), Dodonaea (4.0), Tridax (3.67)
RR-N-P-7a	"	Poolmameedi	Dec. 1988	Unifloral (Ailanthus-49.67)	S-Guizotia (23.67) I-Coriandrum (12.33), Carum (4.67), Brassica (3.67)
RR-N-N-60a	"	Nawabpet	Jan. 1990	Unifloral (Carum-57.0)	S-Sphaeranthus (24.33) I-Brassica (8.33)
RR-M-K-43a	Marpally	Kothlapur	Dec. 1988	Multifloral No predominant pollen	S-Cleome (25.33), Carum (18.67) I-Sphaeranthus (11.67), Ricinus (10.67), Brassica (9.33), Mangifera (6.33), Carthamus (4.0)
RR-M-P-44a	"	Patlur	Feb. 1989	Unifloral (Coriandrum-53.0)	I-Prosopis(8.0), Sopubia (6.67), Helianthus (6.33), Triumfetta (6.0), Eucalyptus (4.67), Sphaeranthus, Tridax (each 3.33)
RR-M-S-45a	"	Siripura	Dec. 1988	Unifloral (Carum- 58.33)	I-Ailanthus (5.0), Cleome (4.67), Cajanus (4.33), Carthamus (4.0), Sphaeranthus (3.67)
RR-M-P-47a	"	Peddapur	Feb. 1989	Unifloral (Carum-77.0)	I-Sphaeranthus (8.67), Phoenix (4.67)
RR-P-C-24a	Pargi	Chiguralpalli	Jan. 1989	Unifloral (Carum- 57.33)	I-Carthamus (6.0), Ageratum, Ricinus (each 4.67), Sphaeranthus, Coriandrum (each 4.0), Brassica (3.67), Cajanus (3.33)
RR-P-P-25a	"	Pargi	"	Unifloral (Carum-68.33)	I-Carthamus (7.33), Coriandrum (4.67), Cajanus (4.0)

* Honey samples of *Apis dorsata*; S - Secondary pollen types (16-45 %); I - Important minor pollen types (3-15 %)

the various pollen types (up to important minor category) recovered from the honey samples.

The species encountered only as minor pollen types (less than 3%) in the total contingent of honeys investigated and whose contribution to the honey production of Ranga Reddy district during winter months is negligible, were represented by *Terminalia* sp., *Citrus* sp., *Aspidopterys indica* (Roxb.) Hochr., *Asteracantha longifolia* (L.) Nees., *Melilotus alba* Lamk., *Evolvulus alsinoides* (L.) L., *Salvia officinalis* L., *Impatiens balsamina* L., *Vernonia cinerea* (L.) Less., *Commelina* sp., *Parkinsonia aculeata* L., *Xanthium strumarium* L., *Borreria articularis* (L.) F.N. Will., *Sonchus oleraceus* L., *Coccinia grandis* (L.) Voigt., *Peltophorum pterocarpum* (DC.) Backer ex K. Heyne, *Chenopodium album* L., *Capparis* sp., *Leucaena leucocephala* (Lam.) de Wit., *Erythrina indica* Lamk., *Portulaca oleracea* L., *Alternanthera sessilis* (L.) R. Br. ex DC., *Acacia* sp., *Oldenlandia umbellata* L., *Delonix regia* (Boj. ex Hoof.) Raf., *Momordica charantia* L. and *Caesalpinia* sp.

The number of pollen types found in each honey sample of *Apis dorsata* was between 7 and 17 ($\bar{X} = 11$) and that of *A. florea* between 9 and 29 ($\bar{X} = 17$). This indicates that *A. florea* bees have visited more number of taxa than *A. dorsata* for their nectar requirements.

In all 60 pollen types of nectariferous plants were recovered from the honeys studied. Pollen frequency in the total contingent of samples and its abundance (%) in each honey sample constitute a reliable expression of the regional importance of bee plant as a nectar source. In this study, the pollen of *Carum copticum* has been encountered in all the honeys analysed. It constituted the predominant pollen type in 32, secondary in 8, important minor in 13 (table 1) and minor in 4 honey samples (21b, 50c, 40a and 44a). The *Carum* honeys are deep

amber coloured and of mild but characteristically scented flavour.

Carum copticum, commonly known as Bishop's weed (Ajwan) is cultivated in considerable acreage in Ranga Reddy district for its medicinal and condimental seeds. The pollen productivity of this taxon is 10,200 grains per anther (Kalpana & Ramanujam 1991). The flowers of *Carum* are repeatedly visited at close intervals by all the three species of honey bees viz., *Apis cerana*, *A. dorsata* and *A. florea* for nectar and pollen, particularly in the early hours of morning between 6 and 8 A.M. Our observations indicate that it is the nectar that is heavily foraged than the pollen.

Discussion

The pollen characterization of 57 winter honeys from the agricultural tracts of Ranga Reddy district has brought to light that *Carum copticum* provided the major nectar source. *Guizotia abyssinica*, *Coriandrum sativum*, *Mangifera indica* and *Ageratum conyzoides*, which have been recorded as predominant pollen in atleast two unifloral honeys are considered as reliable sources of nectar for the honey bees of this district.

The occurrence of *Carum copticum* pollen in all the winter honeys and its predominant status in 62.75% of the unifloral honeys is remarkable and could be attributable not only to the widespread cultivation of this crop plant, but also to the preference of the honey bees for its nectar. Both our laboratory and field studies clearly indicate that *Carum* honeys may be considered as characteristic winter honeys of Ranga Reddy district.

The information provided in this study may profitably be utilized in the prospective bee-keeping enterprises of this district.

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