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Pollen diversity in summer honey samples of forest area in Gadchiroli district, India

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ABSTRACT

Melisssopalynological analyses are useful in enhancement of bee keeping industries. Pollen analysis of the nectar sources of *Apis dorsata* and *Apis florea* during summer honey samples from forest area of Gadchiroli district was carried out. 50 samples were collected during summer 2005 to 2009. Pollen grains were identified from reference slides, 18 samples were unifloral and 32 were multifloral. A total 72 pollen types were classified and they were representing 29 families. In the study major pollen types were recorded viz. *Ageratum conyzoides, Syzygium cumin, Eucalyptus globulus, Terminalia arjuna, Tridax procumbens, Pongamia pinnata* etc. The data reflect the floral situation of the place where particular honey was produced and identification of geographical origin based on the presence of combination of pollen types of the particular area and this area is suitable for establishing apiary industries.

Key word: pollen, Honey, Geographical origin, Gadchiroli.

INTRODUCTION

Gadchiroli District is located on the North- Eastern side of the Maharastra State. It is situated between 18.43' to 21.50' North latitude, 79.45' to 80.53'East longitude.This essentially indicates the Gadchiroli District is located in the Deccan Plateau. District has State borders of Andhra Pradesh and Chattisgarh and is categorised as tribal and undeveloped district and most of the land is covered by forest and hills. The forest has covered more than 78.40% (11694.059 Km) of geographical area of district. The main profession of the people is farming. There are no large scale industries in entire district except few. District is economically backward. In present work Pollen analysis of honey were carried out to characterize the honeys and provide important information about the pollen composition of regional flora . pollen frequency is often used to verify and label a honey samples as to the major and minor nectar sources (Kalpana 2005, Kalkar 2009, Bhargava *et al* 2009). This information has important commercial value.

Honeybees visit plants for either nectar or pollen or both which serves as an adequate source for survival and growth of bee colonies. Only such areas with a more or less supply of both these raw materials are useful for successful bee keeping. helps to enhance apicultural practices which provides subsidery income to farmer.

MATERIALS AND METHODS

A. Collection of materials

Total 50 samples were collected from various forest tracts of Gadchiroli district during the period 2005-2009. The squeezing of honeycombs was carried out under personal supervision with the help of expert workers. Enough care was taken to see that only the honey storing potion of the comb was subjected to squeezing for the removal of honey.

B. Labeling of honey-samples

The samples collected were labeled by including the first letters of district followed by forest range, village and then type of hive of honeybee (i.e. either *Apis dorsata* or *Apis florea*). For convenience where more than one name begins with same letter then, second and even sometimes third letter was also used for abbreviations. For example , Forest ranges included were Chatgaon and Choudampalli, hence for Chatgaon "Cha" is used as abbrevation and for Choudampalli, "Cho" is used while labeling the samples as both the ranges begin with "Ch", third letter was used. The sample GChoSD means the sample is collected from Gadchiroli district (G), Choudampalli forest range (Cho) and Singanpalli village of *Apis dorsata* (D) hives. Whereas "D" and "F" represents the sample collected from dorsata and florea hives of *Apis*. At the end the numerical number of collected samples is given. For example, GChoSD 2, GGhSD20, GEED 12 and so on.

C. **Field surveys and Preparation of references slides –** Several field trips were undertaken to the Gadchiroli district for the collection of honey. During these visits collection of the existing local flora was carried out. The plant area, their habits, their utility to honey bees as nectar sources were recorded.

Herbarium specimens of the local flora were made and identified with the help of Nagpur University herbarium and standard literature. Polleniferous material of all the identified plants was collected and reference slides were prepared using Erdtman's (1960) acetolysis method. The polleniferous material was fixed in 70% alcohol. It was then crused, filtered and certifuged at 2500 rpm. The pollen sediment was treated with glacial acetic acid and centrifuged. The glacial acetic acid decanted off and pollen sediment was treated with acetolysed mixture (9 part Acetic anhydride and 1 part of concentrated Sulphuric acid was added drop by drop) and heated in water bath till brown colour appeared. After cooling it was centrifuged and supernatant liquid decanted off. The sediment was then treated with glacial acetic acid. After slight warming the pollen was mounted in glycerin jelly and covered by cover slip.

Pollen morphological characters of the local flora were studied with the help of reference slides and standard literature.

D. Analysis of honey samples

I) Qualitative analysis :

Qualitative analysis of honey samples was carried out to recognize the botanical, geographical origin and season of production of honey based upon the pollen types of that particular region.1 ml of the honey sample was dissolve in 10 ml distilled water and centrifuged for 5-7 minutes. This was subjected to acetolysis method (Erdtman, 1960). Three pollen slides were prepared for each sample and studied critically for their pollen contents.The morphological characters of the pollen types recorded were noted and the pollen type was identified with the help of reference slides and relevant literature to genus and species. In some cases however identification was possible only up to family. A few types, which were not be assigned to even a family, were placed in the unknown category.

II) Quantitative Analysis:

Quantitative analysis of honey samples was aimed at estimating the relative numerical frequencies of diverse pollen types recorded in each honey sample to facilitate preparation of pollen spectra and their chief nectar sources.The frequency classes and frequencies (%) of the pollen types of each sample were determined in accordance with Louveaux et al (1978). The pollen grains were counted at random in various microscope fields of all three slides prepared by acetolysis technique. For determining the frequency classes, 300 pollen grains (100 per slide) and for calculating the pollen frequencies 1200 grains (400 per slide) were counted. The counts of pollen grains of non melliferous (nectar less) or anemophilous plants were substracted

from the total number before calculation the frequencies of pollen of melliferous (nectar producing) plants. As recommended by the international commission for Bee Botany for frequency classes were recognized viz.
P – Predominant pollen (45%) of the pollen grains counted.
S – Secondary pollen (16-45%)
I – Important minor Pollen (15-3%)
M – Minor pollen (<3%)

The honeys were then designated as "unifloral" if they contain more than 45% of one pollen taxa, "Bifloral" if they contain two pollen taxa, showed dominance and represented in between 16-45% and "Multifloral" if they contain more than two pollen taxa are showed dominance.

RESULTS AND DISCUSSION

Analysis of 50 summer honey samples has been carried out. Out of which, 36% honey samples were found to be unifloral and 64% were found to be multifloral. Total 72 pollen types (66 melliferous and 6 non melliferous) referable to 29 families were recorded from these honey samples shown below in Table 1.

Table 1: Frequency Classes and Frequencies (%) of pollen types of *Apis dorsata, Apis florea* honeys summer at various forest range in Gadchiroli District

Sr. No.	Honey Samples	Pollen Types		
				%
Choudampali Range				
1	**GChoSF 1**	**P**	Nil	
		S	*Ageratum conyzoides*	28.5%
			Terminalia arjuna	20.5 %
			Schleichera oleosa	18.5 %
		I	*Tridax procumbens*	15%
			Achyranthus aspera	10.5%
			Brassica nigra	3.5%
		M	*Ocimum scantum*	2.5%
			Vernonia indica	1.5%
2	**GChoSD 2**	**P**	Nil	-
		S	Terminalia arjuna	30.5%
			Azadirachta indica	20%
			Ageratum conyzoides	20.85%
			Capparis grandis	15.5%
		I	*Sphaeranthus indicus*	10.2%
			Mimosa hamata	5%
		M	*Nil*	
Etapalli Range				
1	**GEEF 3**	**P**	*Citrus sp*	79.25%
		S	Nil	-
		I	*Woodfordia fruticosa*	10.5%
			Tridax procumbens	9.5 %
		M	*Acacia nilotica*	0.75%
2	**GEED 12**	**P**	Nil	
		S	*Schleichera oleosa*	25%
			Ageratum conyzoids	22%
			Butea onosperma	20%
			Madhuca indica	18%
		I	*Aegle marmelos*	10%
		M	*Evolvulus alsinoides*	2.5%

			Careya arborea	1.9%
			Rungia repens	0.58%
			Acacia nilotica	0.35%
3	**GEEF 95**	***P***	Nil	
		S	*Portulaca oleracea*	38%
			Tridax procumbens	31%
		I	*Woodfordia fruticosa*	15%
			Feronia elephantum	9.8%
			Helictors isora	3%
		M	*Vitex negundo*	2.5%
			Unknown	1.8%
4	**GEGoD 103**	**P**	*Syzygium cumini*	*55%*
		S	**Nil**	
		I	*Terminalia bellirica*	*15%*
			Schleichera oleosa	*13%*
			Albizia lebbeck	9.5%
			Mangifera indica	7.5%
		M	Nil	
5	**GEGoD 104**	P	Nil	
		S	Syzygium cumini	40%
			Mangifera indica	20%
		I	Capparis grandis	7.9%
			Woodfordia fruticosa	5.8%
			Lantana camera	4%
		M	Sphaeranthuis indicus	2.5%
			Citrus sp	*1.8%*
6	**GEED 105**	*P*	*P-Nil*	
		S	*Butea monosperma*	*35%*
			Terminalia bellirica	*28%*
			Mangifera indica	*18%*
		I	*Cappris spp.*	*15%*
			Sphaerathus indicus	*6.5%*
		M	*Mimosa sp*	*2.3%*
			Lantana camara	*1.8%*
7	**GEED 106**	*P*	*Nil*	
		S	*Pongamia pinnata*	*32%*
		I	*Butea monosperma*	*20.5%*
			Mangifera indica	*13%*
			Zizypus mauritiana	*12.18%*
			Schleichera oleosa	*12%*
			Sphaeranthus indicus	*5.3%*
			Mimosa sp	*4.2%*
		M	*Nil*	
Ghot Range				
8	**GGhSD 10**	**P**	*Nil*	
		S	*Terminalia arjuna*	**25%**
			Butea monosperma	23%
			Sapindus emarginatus	*19.30%*
		I	*Careya arborea*	*10.50 %*
			Helianthus annus	*10.5%*
			Syzyzium cumini	*8%*

			Brassica sp	*3.7 %*
		M	*Nil*	
9	**GGhAdF 17**	*P*	*Nil*	
		S	*Tectona grandis*	*30%*
			Capparis grandis	*25%*
			Lantana camara	*20%*
		I	*Ageratum conyzoide*	*10.50%*
			Sphaeranthus indicus	*10%*
			Vernonia cinerea	*5%*
		M	*Nil*	
10	**GGhAdD 18**	*P*	*Nil*	
		S	*Tamirindus indica*	**35%**
			Tectona grandis	**20%**
			Madhuca indica	**19%**
		I	*Ocimum basillicum*	**10%**
			Tridax procumbens	**10%**
			Vitex negundo	**3.5%**
		M	*Xanthium strumarium*	*1.6%*
11	**GGhAdF 19**	*P*	*Rungia repens*	*86%*
		S	*Nil*	
		I	*Vernonia cinerea*	*11.8%*
		M	*Woodfordia fruticosa*	*2.3%*
12	**GGhSD 20**	*P*	*Syzygium cumini*	*92%*
		S	*Nil*	
		I	*Ageratum conyzoides*	*5.5%*
		M	*Sphaeranthus indicus*	*2.5%*
13	**GGhSD 21**	*P*	*Nil*	
		S	*Azadirachta indica*	*30%*
			Ageratum conyzoides	*30%*
			Sonchus spp	*20%*
			Pongamia pinnata	*20%*
		I	*Nil*	
		M	*Nil*	
Bhamragad Range				
1	**GBTD 13**	*P*	*Terminalia arjuna*	*63%*
		S	*Nil*	
		I	*Butea monosperma*	*10%*
			Largerstromia parviflora	*8%*
			Embelica officinalis	*7%*
			Cassia fistula	*7%*
		M	*Cyperus rotundus*	*2.5%*
			Hibiscus hirtus	*2.2 %*
			Bombox ceiba	*1.5%*
2	**GBBD 15**	*P*	*Nil*	
		S	*Pongamia pinnata*	*29%*
			Syzygium cumini	*20%*
		I	*Peltophorum pterocarpus*	*13.5%*
			Madhuca indica	*16%*

			Borassus flabellifers	*10%*
			Woodfordia fruticosa	*5.3%*
		M	*Sphaeranthus indicus*	*2.75%*
			Poaceae type	*0.33%*
Alapalli Range				
1	***GAVF 16***	*P*	*Nil*	
		S	*Schleichera oleosa -*	*32%*
			Prosopis julifera	*28%*
			Tectona grandis	*19.5%*
		I	*Ricinus communis -*	*13%*
			Xanthium strumarium	*5.3%*
		M	*Mimosa pudica -*	*2.1%*
			Borassus flabellifer	**1.3%**
Markhanda Range				
1	**GMaChaF 11**	*P*	*Syzygium cumini*	*50%*
		S	*Nil*	
		I	*Prosopis juliflera*	*10%*
			Coriandrum sativum	*8%*
			Woodfordia fruticosa	*10%*
			Tinospora cordifolia	*8%*
			Carum copticum	*4%*
			Acacia nilotica	*3.5%*
			Bombox ceiba	*3.5%*
		M	**Citrus spp.**	**2.3%**
2	**GMaAsF 14**	*P*	*Eucalyptus globulus*	*78%*
		S	*Nil*	
		I	*Alternanthera sessilis*	*13.7%*
		M	*Cassia fistula*	*2.5%*
			Feronia elephantum	*2.5%*
			Waltheria indica	*2.3%*
			Vernonia cinerea	**1%**
3	**GMaAsF 31**	*P*	*Nil*	
		S	*Carica papaya*	*24%*
			Pongamia pinnata	*22%*
		I	*Schleichera oleosa*	*15%*
			Capparis grandis	*13%*
			Buchanania lanzan	*9%*
			Alternenthera sessilis	*8.5%*
			Sida acuta	*5%*
			Unknown	**3.5%**
4	**GMaAsF 36**	*P*	*Eucalyptus globulus*	*52%*
		S	*Nil*	
		I	*Tectona grandis*	*15%*
			Terminalia arjuna	*15%*
			Sapindus emarginatus	*12%*
			Sida acuta	*2.7%*
		M	**Unknown**	**2.5%**
5	**GMaJaD 37**	*P*	*Nil*	
		S	*Tectona grandis*	*35%*

			Butea monosperma	*25%*
			Alternanthera sessilis	*15%*
			Zizypus maurantina	*13.3%*
			Rungia repens	*10%*
		M	**Cyperus rotundus**	**1.7%**
6	**GMaAdD 38**	*P*	*Lannea coromandelica*	*61.25%*
		S	*Nil*	
		S	*Tridax procumbens*	*25.8%*
		I	*Capparis grandis*	*10.13%*
		M	*Butea monosperma*	*2.8%*
			Bombox ceiba	*1.5%*
			Sphaeranthus indicus	**0.75%**
7	**GMaAdD 39**	*P*	*Nil*	
		S	*Tectona grandis*	*30%*
			Tridax procumbens	*20.3%*
			Lannea coromandelica	*18%*
		I	*Alternanthera sessilis*	*10%*
			Schleichera oleosa	*8.5%*
			Capparis grandis	*7.2%*
			Erythrina indica	**6.5%**
		M	**Nil**	
8	**GMaUD 44**	*P*	*Nil*	
		S	*Tamarindus indica*	*28%*
			Schleichera oleosa	*24%*
			Zizypus xylocarpa	*18%*
		I	*Capparis grandis*	*15%*
			Butea monosperma	*10%*
			Tephrosia purpurea	*3.8%*
		M	**Bombox ceiba**	**2.3%**
9	**GMaKaD 63**	*P*	*Eucalyptus globulus*	*85%*
		I	*Madhuca indica*	*5.6%*
			Rungia repens	*5.1%*
			Hygrophila auriculata	*3.9%*
		M	*Nil*	
10	**GMaKaD 64**	*P*	*Nil*	
		S	*Rungia repens*	*35%*
			Tectona grandis	*30%*
		I	*Lantana camara*	*11%*
			Alternenthra sessilis	*10%*
			Cordiospermum halicacabum	*7.5%*
			Ocimum sanctum	*3.2%*
		M	*Vernonia cinerara*	*2.3%*
			Cassia tora	*2.1%*
11	**GMaAnD 65**	*P*	*Terminalia arjuna*	*80%*
		S	*Nil*	
		I	*Tridax procumbens*	*6.5%*
			Tectona grandis	*5%*
			Butea monosperma	*3.5%*

			Ocimum sanctum	*3.5%*
			Unknown	*3%*
		M	**Nil**	
12	**GMaAnF 66**	*P*	*Nil*	
		S	*Ageratum conyzoid*	*35%*
			Achyrantus aspera	*20%*
			Tridax procumbens	*18*
		I	*Schleichera oleosa*	*12.5%*
			Lannea coromandelica	*10%*
		M	*Xanthium strurmanium*	*2.5%*
			Vernonia cineara	**2%**
13	**GMaAsF 67**	*P*	*Terminalia arjuna*	*89.18%*
		S	*Nil*	
		I	*Xanthium strumarium*	*3%*
		M	*Ocimum basillicum*	*2.5%*
			Bombax ceiba	*2.5%*
			Unknown	**3%**
14	**GMaAsD 87**	*P*	*Nil*	
		S	*Eucalyptus globulus*	*40%*
			Pongamia pinnata	*35%*
		I	*Zizypus xylocarpa*	*12%*
			Tinospora cordifolia	*8%*
			Butea monosperma	*5%*
		M	*Nil*	
15	**GMaUF 88**	**P**	**Pongamia pinnata**	**100%**
16	**GMaUD 89**	*P*	*Nil*	
		S	*Pongamia pinnata*	*28%*
			Butea monosperma	*25.8%*
		I	*Tectona grandis*	*15.25%*
			Madhuca indica	*13.83%*
			Tridax procumben	*9.7%*
			Sphaerantus indicus	*5.8%*
			Capparis grandis	*3.2%*
		M	*Nil*	
17	**GMaKoF 90**	*P*	*Nil*	
		S	*Schleichera oleosa*	*30%*
			Delonix regia	*25%*
			Terminalia tomantosa	*20%*
		I	*Zizypus mourintana*	*10%*
			Waltheria indica	*9%*
			Woodfordia fructicosa	*6%*
		M	*Nil*	
18	**GMaKoF 91**	*P*	*Nil*	
		S	*Eucalyptus globulus*	*30%*
			Tamarindus indica	*23%*
			Pongamia pinnata	*18%*
		I	*Ageratum conyzoides*	*12%*
			Ocimum sanctum	*5.2%*
			Porlulaca oleracea	*4%*

			Vernoria cinerea	*3.5%*
			Cardiospermum halicacabum	*3%*
		M	*Cassia tora*	*2.5%*
19	**GMaKoD 92**	*P*	*Nil*	
		S	*Butea monosperma*	*35%*
			Tridax procumbens	*25%*
		I	*Madhuca indica*	*10%*
			Terminalia arjuna	*9.8%*
			Achyranthus aspera	*7%*
			Ageratum conyzoides	*6.5%*
			Cassia tora	*4%*
		M	*Brassica nigra*	*1.4%*
			Vernonia cinerea	*1.5%*
20	**GMaAsF 93**	*P*	*Nil*	
		S	*Capsicum frutescens*	*30%*
			Capparis grandis	*20%*
		I	*Tridax procumbens*	*15.5%*
			Ricinus communis	*10.5%*
			Zizypus mauritiana	*9.5%*
			Sapindus emarginatus	*9%*
		M	*Achyranthus aspera*	*2.8%*
			Xanthium strumarium	*2.5%*
21	**GMaAsF 94**	*P*	*Nil*	
		S	*Lannea coromandelica*	*30%*
			Schleichera oleosa	*25%*
			Tridax procumbens	*16%*
		I	*Achyranthus aspera*	*12.2%*
			Vernonia cinerea	*7.5%*
			Brassica sp	*5.8%*
			Tinospora cordifolia	*3.5%*
		M	*Nil*	
22	**GMaUF 100**	*P*	*Nil*	
		S	*Eucalyptus globulus*	*38%*
			Schleichera oleosa	*17%*
			Tamarindus indica	*16%*
		I	*Terminalia arjuna*	*9.6%*
			Capparis grandis	*9%*
			Syzygium cumini	*7.3%*
		M	*Citrus sp*	*2.5%*
			Cassia tora	*0.66%*
23	**GMaUF 101**	*P*	*Nil*	
		S	*Terminalia sp*	*28%*
			Lannea coromandelica	*25%*
			Schleichera oleosa	*20%*
		I	*Bombax ceiba*	*12.5%*
			Woodfordia fruticosa	*8.6%*
			Careya arborea	*3.4%*
		M	*Rutaceae*	*1.3%*
			Cassia tora	*1.3%*

24	**GMaKoF 102**	*P*	*Schleichera oleosa*	*51%*
		S	*Lannea coromandelica*	*20%*
			Careya arborea	*16%*
		I	*Citrus sp*	*8%*
			Capparis grandis	*5.2%*
		M	*Poaceae*	*0.75%*
Mulchera Range				
1	**GMuGaF 32**	*P*	*Schleichera oleosa*	*67%*
		S	*Nil*	
		I	*Zizypus xylocarpa*	*11.3%*
			Mangifera indica	*10.5%*
			Sapindus emarginatus	*5.7%*
			Capparis grandis	*3%*
		M	**Borassus flabellifer**	**2.5%**
2	**GMuGaF 33**	*P*	*Syzigium cumini*	*68%*
		S	*Nil*	
		I	*Ageratum conyzoides*	*13%*
			Zizypus xylocarpa	*10%*
			Schleichera oleosa	*4.7%*
			Xanthium starumarium	*3.5%*
		M	*Vernonia cinerea*	*1.5%*
			Poaceae type	**0.33%**
3	**GMuGaD 34**	*P*	*Syzygium cumini*	*75%*
		S	*Nil*	
		I	*Schleichera oleosa*	*8.3%*
			Tectona grandis	*7.3%*
			Terminalia arjuna	*5.8%*
			Borassus flabellifer	*3.1%*
		M	**Nil**	
4	**GMuGaD 35**	*P*	*Nil*	
		S	*Ageratum conyzoides*	*35%*
			Tectona grandis	*20%*
		I	*Feronia elephantum*	*15.5%*
			Butea monosperma	*12%*
			Terminalia arjuna	*9%*
			Clerodendrum inermae	*5%*
			Xanthium strumarium	*3.4%*
		M	*Nil*	
5	**GMuMuF 40**	*P*	*Terminalia arjuna*	*81%*
		S	*Nil*	
		I	*Schleichera oleosa*	*12%*
			Capparis grandis	**7%**
		M	**Nil**	
6	**GMuMu F 41**	*P*	*Terminalia arjuna*	*78%*
		S	*Nil*	
			Woodfordia fruticosa	*10%*
			Justica procumbens	*7.5%*
			Unknown	*4%*
		M	*Syzygium cumini*	*2.3%*

			Vernonia cinerea	*1.5%*
			Poaceae	*0.75%*
Chatgaon Range				
1	**GChaGiD 43**	*P*	*Nil*	
		S	*Ageratum coniyzoides*	*30.50%*
			Mangifera indica	*29%*
			Terminalia tomantosa	*25%*
		I	*Sphaeranthus indicus*	*14%*
		M	*Capparis grandis*	*1%*
			Bombox ceiba	**1%**

Abbreviations:

Adayal – Ad; Allapali – A; Ankhoda – An; Ashti – As; Bhamragad – B; Chatgoan – Cha; Choudampali – Cho; Etapali – E; Gandhinagar – Ga; Ghot – Gh; Goadsur-Go; Gilgaon _ Gi; Jayrampur – Ja; Jimalghata – Ji; Kadoli – Ka; Konsari – Ko; Markhanda – Ma; Mulchera – Mu; Permili – P; Rengewai – R; Saknapur – S; Tadgaon – T; Umari – U; Velgur – V

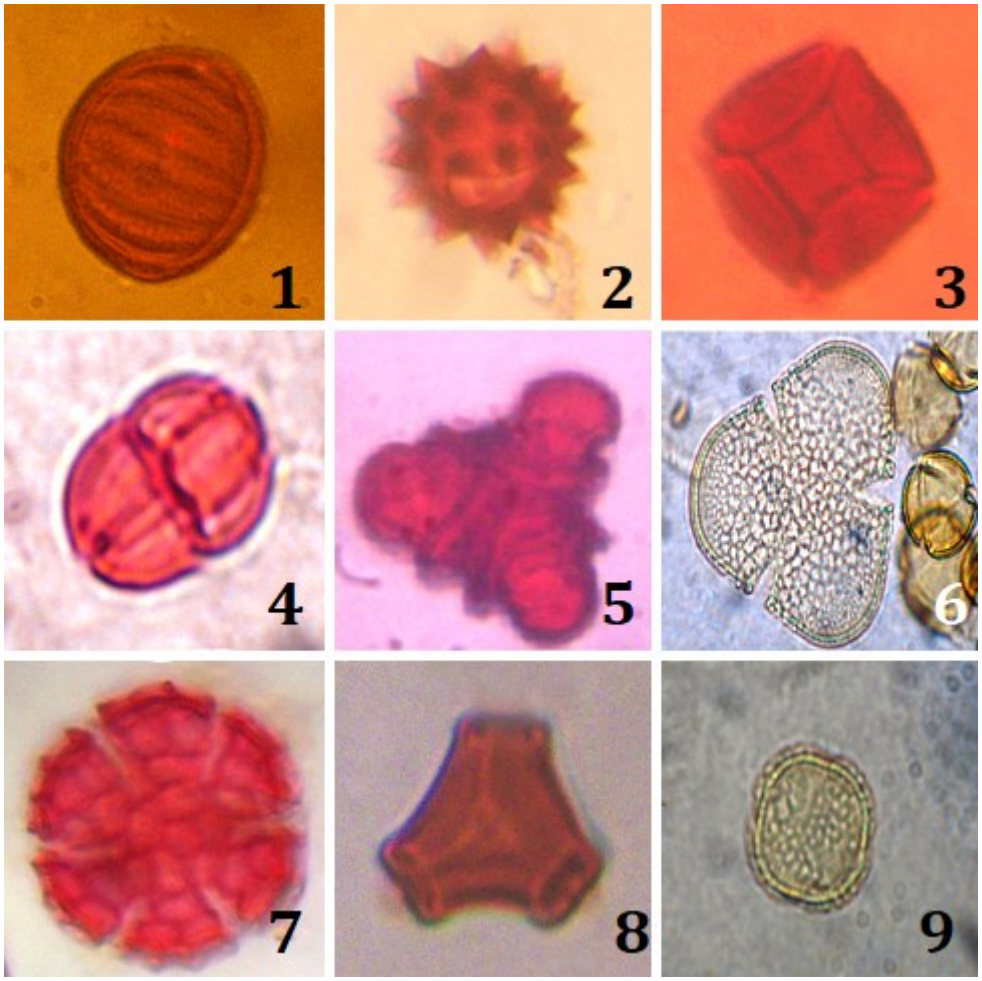

Fig . 1. *Hygrophila auriculata 2. Sphaerantus indicus, 3. Schleichera oleosa, 4.Mimosa hamata 5.Careya arberea 6.Bombox ceiba, 7.Ocimum sanctum8.Eucalyptus globulus, 9.Citrus sp*.

DISCUSSION

The unifloral honeys were assigned to *Syzygium cumini* (5), *Terminalia arjuna* (4), *Eucalyptus globulus* (3), *Schleichera oleosa* (2), *Citrus* sp (1), *Rungia repens (*1), *Pongamia pinnata* (1) and *Lannea coromondelica* (1).

Major Secondary pollen types encountered in summer honeys were- A*geratum conyzoides, Butea monosperma, Eucalyptus globulus, Lannea coromandelica, Mangifera indica, Pongamia pinnata, Portulaca oleracea, Rungia repens, Schleichera oleosa, Sphaeranthus indicus,*

Syzygium cumin,Tamarindus indica, Tectona grandis, Terminalia arjuna, Tridax procumbens.

Common important minor types included pollen types viz. *Sphaeranthus indicus, Justica procumbens, Feronia elephantum, Cleradendrum inermae, Xanthium strumarium, Borassus flabellifer, Zizypus xylocarpa, Sapindus emarginatus, Mangifera indica, Capparis grandis, Woodfordia fruticosa, Careya arborea, Waltheria indica, Vernonia cinerea, Vernonia indica, Achyranthus aspera, Portulaca oleracea, Ocimum sanctum, Tinospora cordifolia, Butea monosperma, Hygrophila auriculata, Tephrosia purpurea, Rungia repens, Alternaethera sessilis, Buchanonia lanzan, Tectona grandis, Terminalia arjuna, Ocimum basillicum, Tridax procumbens* and others. Our observations were supported by Bhusari,et.al, 2005 in *Apis* Honey from Maharashtra.

Sheshagiri (1985), Agashe and Scinthia (1995), Agashe (1997), brought out important findings such as occurrence of unifloral honeys from *Eucalyptus, Coriandrum sativum, Syzygium cumini, Psidium guajava, Pongamia pinnata* and *Phyllanthus* from Dharampuri district, Bangalore and it environs costal Karnataka district of Bangalore and Udupi. Seethalakshmi (1980) on the basis of pollen contents of 12 honey samples from 8 states indicated that the pollen spectra of honey unravel their geographical origin and recorded *Syzygium cumini, Mimosa rubicalis* as a predominant pollen types. Similar finding also reported in our present work

CONCLUSION

The nectar is major raw resource for the bee keeping industry. It transforms into honey after conservation by the bee. Similarly pollen is also needed for the growth of the bees. The outcome of the present studies is that, it explored 64 nectar sources from this region, among these 8 are predominant , 56 are secondary nectar sources and important minor and minor nectar sources. This information of nectar sources will definitely help in promoting bee keeping industry. Such studies will also be helpful in improving economy of the farmer, rural and tribal people as it will add as a subsidiary income

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