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RESEARCH ARTICLE

Bee Plants of *Apis dorsata* during Winter Season from Coonoor Region, Nilgiris, Tamil Nadu, India

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Abstract

The present study analyzed *Apis dorsata* honey from the forest of Coonoor slopes in the Nilgiris with a view to know the pollen and nectar sources for the bees. As part of the investigation, 5 honey samples were collected from the honey hunters during winter season of Nov-Dec 2010-2011 and samples were acetolysed. A total of 12 species belonging to 11 families were identified. The samples were categorized as multifloral honey. It was found that *Syzygium cumini* and *Acacia* spp. were more frequent (more than 50%) in the samples. The pollen spectrum shows that during winter, dorsata bees forage on plantation crops like coffee and from wild species like *S. cumini, Acacia* spp., *Terminalia* spp. and *Strobilanthes kunthianus* for their colony survival and also help in pollination of these species.

Keywords: *Apis dorsata*, Coonoor slopes, pollen, nectar sources, multifloral honey, *Syzygium cumini*.

Introduction

Mellissopalynology is an applied branch of palynology dealing with microscopic analysis of the pollen contents of seasonal honeys and pollen loads from a locality, when supplemented with critical field studies involving phenology and floral biology, providing reliable information regarding the floral types which serve as major and minor nectar and or pollen sources for the honey bees (Attri, 2010). Analysis of pollen contents of honey is useful in the determination of the geographical and botanical origin of particular type of honey (Stawiarz *et al*., 2010). According to Jones and Bryant (2004) pollen found in honey is used to determine the honey's type. The determination of geographical origin is generally based on the entire pollen spectrum being consistent with the flora of a particular region (Louveaux *et al.,* 1978) or the presence of a combination of pollen type of the particular area. Pollen analysis of honey is also of great importance for the quality control and help to ascertain whether honey is adulterated or not (Maurizio, 1951; Molan, 1998; Louveaux *et al*., 1978; Terrab *et al*., 2003).

Significant work has been carried out from different states of India by Ramanujam *et al.* (1992), Sivaram (1995), Lakshmi and Suryanarayan (1997), Bhusari *et al.* (2007), Bera *et al.* (2007), Bhargav *et al.* (2009) and Shilpa and Ratan (2011). Melissopalynology of *Syzygium* honey has been studied by Suryanarayana (1966). Keeping the above facts in view, this study was aimed to determine the pollen spectrum of *Apis dorsata* honey from the forest of Coonoor region in the Nilgiris with a view to know the pollen and nectar sources for the bees during the winter season.

Materials and methods

Study area: Coonoor is located at 11.35°N 76.82°E, at an altitude of 1,850 m above sea level and is the second largest hill station in the Nilgiri hills after Ooty, TN, India. Coonoor lies in the southern part while Kotagiri lies in the eastern part of the Nilgiris. Coonoor is predominantly moist deciduous forest and home to large number of honey hunters who are experts in both tree as well as cliff honey hunting. The Kurumbas and Irulas who live in these parts have traditionally been practicing honey hunting as an occupation for a long time.

Sample collection: About 5 honey samples were collected during the winter season of Nov-Dec 2010-2011 from honey hunters of Coonoor region. This season is characterized by foggy morning, clear night with sunny noon. The average temperature fluctuates between 10°C and 12°C. The samples were acetolysed following the method of Erdtman (1960) for preparation of the slides.

Pollen analysis: For pollen analysis of the honey samples, the laboratory methods recommended by Louveaux *et al.* (1970; 1978) were used. The pollen types were identified with the help of reference slide of local flora. The pollen types were identified to generic and specific levels, in some cases to family level. Count of 500 pollen grains per sample was interpreted in terms of frequency classes. "Predominant pollen" occurs in excess of 45%, "secondary pollen" is between 16-45%, "important minor pollen" falls between 3 and 15% and "minor pollen" that is found below 3%. Using frequency class system, honey samples are named as unifloral (45%) and mixed floral type.

Table 1. Frequency class and distribution of pollen types recorded from *Apis dorsata* honey.

S. No.	Plant name and family	sample 1	sample 2	sample 3	sample 4	sample 5	FD%
1.	*Acacia* spp. (Mimosaceae)	S	S		M	M	80
2.	*Syzygium cumini* (Myrtaceae)	M	M	S	Im	M	100
3.	*Coffea arabica* (Rubiaceae)				S	S	20
4.	Asteraceae	M				Im	20
5.	*Strobilanthes kunthiana* (Acanthaceae)	S	S				20
6.	*Schleichera oleosa* (Sapindaceae)		S				10
7.	*Ligustrum perrottetii* (Oleaceae)			Im			10
8.	*Rhodomyrtus tomentosa* (Myrtaceae)			M			10
9.	*Cocos nucifera* (Arecaceae)				M	M	20
10.	Apiaceae				M	M	20
11.	*Terminalia* spp. (Combretaceae)				M	M	20
12.	Type 1					Im	10

Frequency classes: Predominant pollen type (P) >45%, Secondary pollen type (S) 16-45%, Important Minor pollen (Im) 3-15%, Minor pollen type (M) <3%, FD-Frequency distribution.

The frequency distribution was also calculated by using Louveaux (1970; 1978) method. The frequency distribution of a taxon in a series of honey samples is determined by dividing the number of samples in which taxon occurs by the total number of samples. Accordingly taxon is classified as “rare” (less than 10%), “infrequent” (10-20%), “frequent” (20-50%) and “very frequent” (more than 50%).

Results and discussion

A total of 12 species belonging to 11 families were identified. Identified species and analytical data such as pollen type, samples No., frequency classes and frequency of distribution are presented in Table 1. Pollen composition of honey samples and percentage of occurrences of pollen is also graphically analyzed in Fig. 1 and 2.

Sample wise analytical data are discussed below:

Sample 1: The analytical data shows that only four types of pollen were identified. Predominant species are not reported from this sample. *Strobilanthes kunthianus* (30.8%) and *Acacia* spp. (28.3%) were recorded as secondary pollen type. *Syzygium cumini* (2.4%) and Asteraceae (2%) pollen type were recorded as minor pollen. Out of 12 species, the percentage of occurrence is 33% and the sample is categorized as multifloral as predominant pollen type was not recorded.

Sample 2: The analytical data shows that only four types of pollen were identified. Predominant species are not reported from this sample. *Strobilanthes kunthianus* (30.4%), *Acacia* spp. (28.8%) and *Schleichera oleosa* (27%) were recorded as secondary pollen type. *Syzygium cumini* (2.6%) was recorded as minor pollen. Out of 12 species, the percentage of occurrence is 33% and the sample is categorized as multifloral.

Sample 3: Predominant species are not reported from this sample and four types of pollen were identified. *Syzygium cumini* (28.6%) pollens were recorded as secondary.

Fig. 1. Pollen composition of *Apis dorsata* honey.

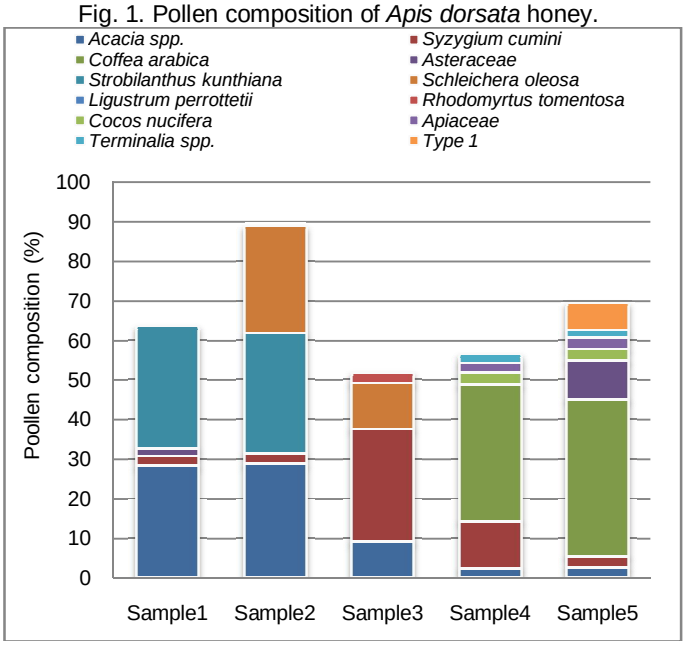
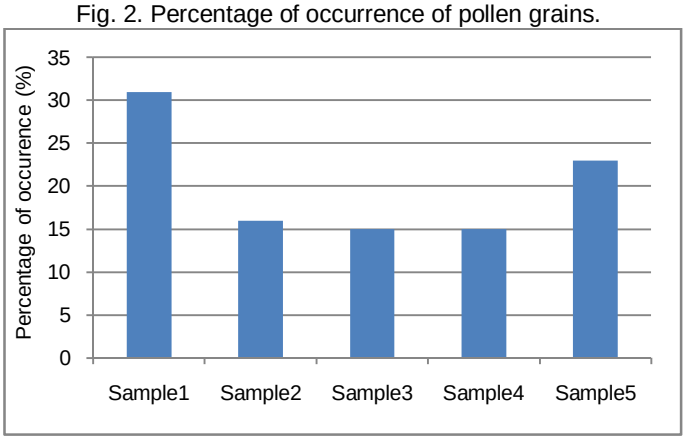


Fig. 2. Percentage of occurrence of pollen grains.



Schleichera oleosa (11.6%) and *Acacia* spp. (9%) were recorded as important minor and *Rhodomyrtus tomentosa* (2.6%) as minor pollen. The percentage of occurrence is 33% and the sample is categorized as multifloral.

Sample 4: Totally six pollen type was identified in this sample. *Coffea arabica* (34.5%) pollen was categorized as secondary, *Syzygium cumini* (12%) pollen as important minor and *Acacia* spp. (2.3%), *Cocos nucifera* (2.9%), Apiaceae (2.4%), *Terminalia* spp. (2.3%) as minor pollen. No predominant pollens are reported from this sample. Therefore, this sample is multifloral and percentage of occurrence is 50%.

Sample 5: Eight pollen types were identified. *Coffea arabica* (39.6%) was recorded as secondary pollen. Asteraceae type (9.8%) and Type 1 (unidentified) (6.8%) as important minor. *Cocos nucifera* (3%), *Syzygium cumini* (2.8%), Apiaceae (2.8%), *Acacia* spp. (2.6%) and *Terminalia* spp. (2%) as minor pollen. Predominant pollen type was not reported and percentage of occurrence is 66%.

It was found that *Syzygium cumini* and *Acacia* spp. were more frequent (more than 50%) (Table 1). The presence of *S. cumini* is due to the flowering period as it flowers during Mar-Apr and Jul-Aug. It has been reported as a predominant pollen type in Karnatatka (Singh and Suryanarayana, 1997), Andhra Pradesh (Lakshmi and Suryanarayna, 1997) and Kotagiri (Shiny and Padmavathy, 2013). *Coffea arabica* has been reported in honey samples from Karnataka (Bhargava *et al.,* 2009). *Coffea* is a self-fertile plant, studies has shown that pollination by bees causes a significant increase in fruit set (Klein *et al.,* 2002). *Coffea* spp. was found to be one of the dominant pollen types of Coorg honey, Karnataka (Shubharani *et al.,* 2012). *Strobilanthes kunthianus* flowers one in 12 years and shows mass flowering providing nectar and pollen as floral reward. Sample 1 and 2 shows *Strobilanthes* pollen as it flowered in 2010. The pollen spectrum shows that during winter dorsata forages on plantation crops like coffee and from wild species like *S. cumini, Acacia* spp., *Terminalia* spp. and *Strobilanthes kunthianus* for the survival of the colony and also help in pollination of these species.

Conclusion

The study shows that the honey samples were multifloral types. Predominant pollen types were not identified from the sample studied. The bees collect nectar from plants available in the area. *Syzygium cumini* and *Acacia* spp. were more frequent in the samples and mass flowering of species like *Strobilanthes* floral display attract pollinators provides nectar and pollen as reward.

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