

Melittopalynological investigation of honeys from Chamarajanagar District, southern Karnataka, India

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ABSTRACT

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Pollen analysis of two honey samples from Gundal Dam and Biligirirangaswamy Betta (B. R. Hills) in Chamarajanagar District, Karnataka has shown rich and diverse pollen assemblage, with abundance of *Ageratum conyzoides* and *Pongamia* sp. pollen (74% and 73% respectively). Therefore, both the plants are the chief sources of nectar flow in their respective areas and hence the honeys used in the present study are monofloral in nature. Further, this could be attributed to their profuse growth in the local floristic as well as peak flowering in the season of honey production. Others such as *Syzygium*, *Terminalia*, *Acacia*, *Grewia*, *Feronia lemonia*, *Caesalpinia*, *Moringa*, *Mimosa pudica*, *Prosopis*, etc. are the secondary sources of nectar and are visited infrequently by bees for forage, whereas the pollen of anemophilous plants such as Poaceae, Cyperaceae, etc. got either trapped in the hives incidentally by winds or inadvertently transported by the bees.

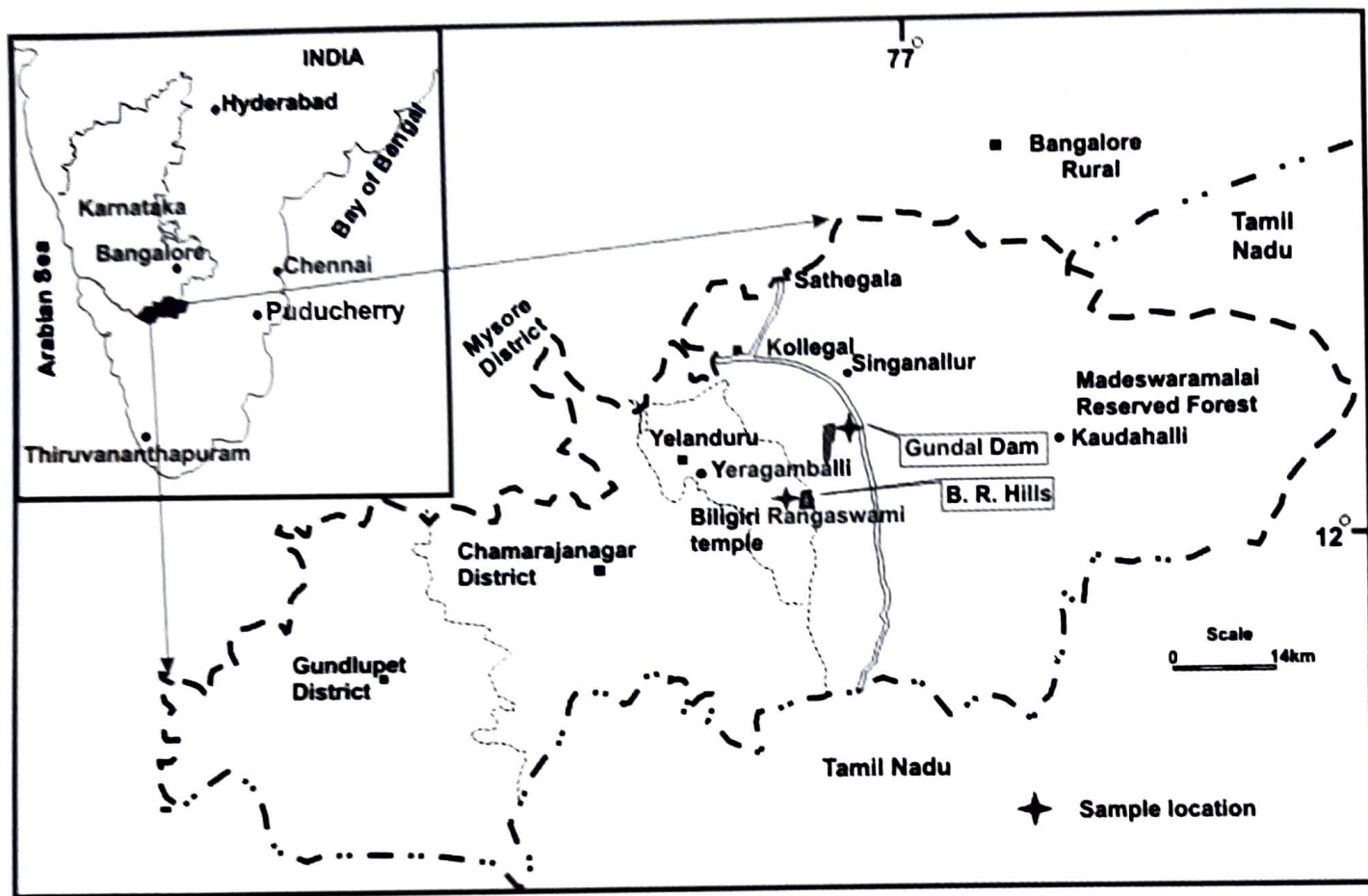
Key-words: Melittopalynology, pollen, monofloral honey, southern Karnataka, India.

INTRODUCTION

Melittopalynology deals with the study of pollen content of honey, which facilitates in ascertaining the botanical origin of honey, i.e. the bee frequently visiting source plants for nectar, the kind and season of honey flow by the qualitative and quantitative analysis of its pollen content. In India most of the studies on this aspect have been conducted from Andhra Pradesh (Ramanujam & Kalpana 1991, Ramanujam & Khatija 1992, 1995, Ramanujam et al. 1992, Jhansi et al. 1994, Lakshmi & Suryanarayana 2004). Some sketchy information is also available in this perspective from Bihar (Suryanarayana et al. 1992), Maharashtra (Deodikar 1964, Deodikar & Thakar 1953, Deodikar et al. 1958), Himachal Pradesh (Sharma 1970, Sharma & Raj 1985), West Bengal (Bhattacharya et al. 1983), Kumaon (Garg & Nair 1974a, b, Verma 1983, 1988) and Uttar Pradesh (Chaturvedi & Sharma 1973, Chaturvedi 1977). However, Karnataka state, which is very prosperous in forest resource and could serve as a potential hub for melittopalynological studies has

remained neglected, barring a few reports from Dakshin Karnataka District (Agashe & Rangaswamy 1997), Bhagamandala (Seethalakshmi 1980), Western Ghat and Chickmagalur District (Phadke 1962, Bhargava et al. 2009). Such studies can provide valuable database in order to divulge the nature of honey and season of nectar flow as well as in understanding the quality of honey whether it is pure or adulterated through the study of pollen content. Hence, in the present paper an attempt has been made to extend such investigations in other area to highlight potentiality of the state, which could contribute in promoting beekeeping on a commercial scale.

The areas of present investigation namely Gundal Dam and Biligirirangaswamy Betta (B. R. Hills) are situated in Chamarajanagar District of southern Karnataka between 12°0' and 12°19' north latitudes and 78°07' and 78°19' east longitudes. Gundal Dam, a water reservoir, is situated at 12 km from Kollegal City, whereas B. R. Hills is a part of Yelandar Taluk and it is about 22 km from Yelandar City (Figure 1).



Text-figure 1. Map showing the sites of investigation in ChamaraJanagar District, Karnataka

MATERIAL AND METHOD

The materials for the present investigation including two lobes of beehives were picked up with the help of local folks in the month of May, 2009 from Gundal Dam and Biligirirangaswamy Betta (B. R. Hills) in ChamaraJanagar District. About 200gm of crude honey was squeezed from each beehive in the polythene bags for the present investigation. Small quantities (20 g) of honeys were dissolved in 50 ml of distilled water to avoid contamination and stirred gently until the samples became homogeneous. They were washed with water twice by centrifuging and decantation. Thereafter, the samples were treated with glacial acetic acid in order to dehydrate them. This is followed by acetolysis

(Erdtman, 1943) using acetolysing mixture (9:1, acetic anhydride and concentrated sulphuric acid). The samples were again treated with glacial acetic acid before washing with distilled water twice. Finally, permanent slides were prepared in glycerine jelly for microscopic examination and were sealed with paraffin wax.

The honey samples gathered from Gundal Dam and BR Hills have yielded huge quantities of pollen grains belonging to various plant taxa, though in variable numbers. A total number of 3909 and 3189 pollen grains were counted in the samples from Gundal Dam and BR Hills respectively taking traverses on the slides, while examining them under light microscope. However, the

Plate 1

1-2. *Acacia*. 3-4. *Caesalpinia*. 5-6. *Sesamum indicum*. 7. *Argemone*. 8. *Eucalyptus*. 9. *Syzygium*. 10-11. *Croton*. 12. *Pongamia*. 13-14. *Feronia lemonia*. 15. Type I. 16. *Bauhinia*. 17-18. *Prosopis*. 19-20. *Ageratum conyzoides*. 21. *Blumea* 22-23. *Grewia*. 24-25. Clusters of pollen in honey

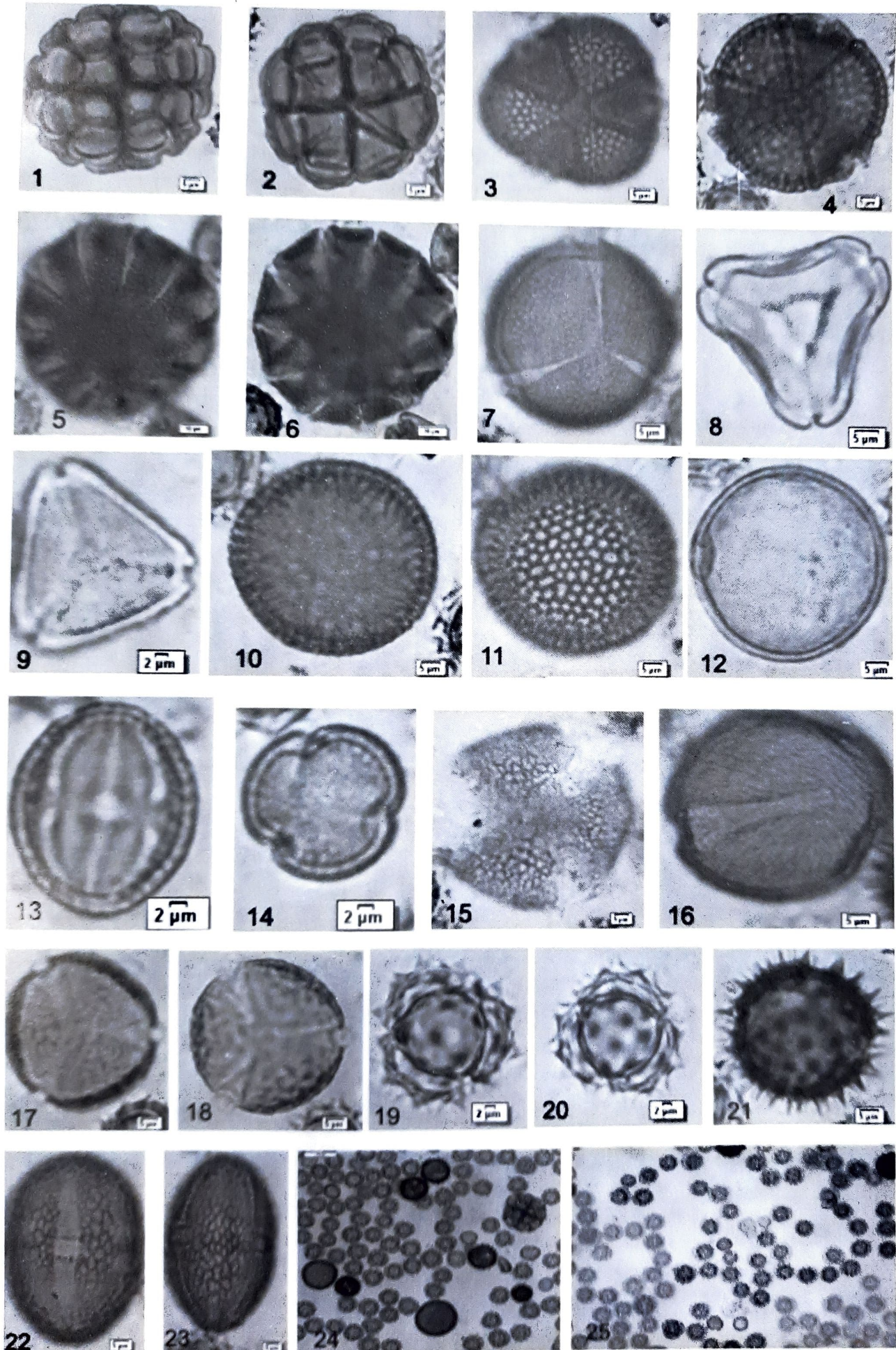


Plate 1

On the other hand, the investigation of honey sample from BR Hills also brings out a much diversified pollen assemblage (Text-figure 2B). In this case, *Pongamia* (73%) is forming the principal chunk of the pollen load. *Mimosa pudica* (10.5%), *Caesalpinia* (10.42%) and *Grewia* (7.2%) are the important minor pollen types encountered. The others such as *Ageratum conyzoides*, *Schleichera*, *Mimosa pudica*, *Terminalia*, *Eucalyptus*, *Prosopis*, *Alternanthera*, *Solanum*, *Loranthus* and *Meliaceae* (0.5% each) along with pollen of nectarless plants belonging to *Poaceae* and *Caryophyllaceae* (0.5% each) are recovered sporadically (Plate 2).

DISCUSSION AND CONCLUSIONS

The analysis of honey has brought out a good prospective for the development of bee colonies in the areas under investigation. Bees utilize the pollen for brood nurturing, increase in colony strength and the nectar for their carbohydrate requirement.

The melittopanynological investigation of the honey sample from Gundal Dam, Chamarajanagar District has demonstrated that the abundance of *Ageratum conyzoides* pollen, constituting a major fraction of 74% of the total pollen recovered. Thus, it is very apparent that the honey manufactured by the bees is monofloral in nature since the International Commission for Bee Botany (ICBB, 1970) has recommended the samples with 45% or more pollen of a single type to this category. Further, it could be inferred that *Ageratum conyzoides* was at full bloom during the period (August-March) of honey production and it was luxuriant in the local flora near the provenance of the beehive, serving a major source of nectar to the bees. *Blumea* sp. was the secondary minor important source of nectar. However, *Syzygium*, *Eucalyptus*, *Sesamum indicum*, *Moringa*, *Ricinus communis*, *Bauhinia* and members of *Oleaceae* were either not in peak flowering at the time of honey production or they grow sporadically around the ambit of beehive as depicted by their stray pollen in the sample. On the other hand, the extremely stray pollen grains of anemophilous plants such as *Poaceae*, *Cyperaceae*, etc. reveal that either they might have got incidentally trapped in the beehive or adhered to the

bees/insects body during their frequent visits in search of nectar.

On the other hand, the investigation of honey sample from BR Hills also from Chamarajanagar District demonstrates a less diversified pollen assemblage. However, among the recovered palynomorphs, *Pongamia* with much high frequency of 73% depicts to be the main source of nectar and, therefore, the honey used in the present study is monofloral in origin too. This could be attributed to its peak flowering during the period of March to May as well as the frequent occurrence of *Pongamia* trees in the vicinity of beehive. *Mimosa pudica*, *Caesalpinia* and *Grewia* were the minor important plants visited by bees to gather the nectar. *Terminalia*, *Prosopis*, *Syzygium*, *Meliaceae* together with herbaceous elements, viz. *Ageratum conyzoides*, *Loranthus*, *Solanum*, *Blumea* sp., etc. were rarely preferred, probably their feeble presence in the local flora. The retrieval of scanty pollen of anemophilous plants such as grasses (*Poaceae*) and *Caryophyllaceae* might have entangled with insects/bees inadvertently while visiting in search of forage.

Thus, from the present investigation of two honey samples from Gundal Dam and BR Hills, southern Karnataka it has become evident that the local floristic composition and flowering period are the sole factors in determination of quality and the production of honey. In both the cases, the honey is monofloral in nature as clearly manifested by the record of pollen of *Ageratum conyzoides* and *Pongamia* with exceptionally high frequencies of the larger fractions 74% and 73% respectively in the samples analyzed. Furthermore, it could be inferred that these taxa were in peak flowering at the time of honey formation. This is also inferred that the bees have not visited far distance in search of nectar as it has been observed that they normally cover a distance of 700 to 900 m, if good forage is available in the environs of the hives (Suryanarayana et al. 1992).

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