

Melissopalynology: A Tool for Assessing Floral Resources of *Apis florea* in Nagarkurnool District, Telangana

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Article Info

Received: 30-06-2023,

Revised: 22-07-2023,

Accepted: 02-08-2023

Keywords:

Melissopalynology, *Apis florea*, Nagarkurnool District.

Abstract

Melissopalynology, the study of pollen grains found in honey, serves as a valuable tool in identifying floral resources utilized by honeybee species. In this study, we investigated the floral resources of *Apis florea* in Nagarkurnool district, Telangana, India, by analyzing pollen content in honey samples collected from various mandals across four revenue divisions. A total of 16 honey samples were collected, comprising four samples from the summer season and the remaining from winter. Analysis revealed the presence of pollen grains from several plant species, with *Prosopis juliflora*, *Xanthium strumarium*, *Psidium guajava*, *Gymnosporia emerginata*, *Borassus flabellifer*, *Phoenix sylvestris*, *Dillenia pentagyna*, *Alangium salvifolium* and *Sapindus emerginatus* being identified as chief floral resources for *Apis florea* in the region.

INTRODUCTION

The honeybee flora is the most important factor that influences the behavior or actions of honeybees and the quality of honey (G.A. Wrigh et al. 2018). *Apis florea*, commonly known as the little bee or the red dwarf honeybee, is a small-sized bee species native to South and Southeast Asia. As an important pollinator and honey producer, understanding its foraging behavior and floral preferences is crucial for ecosystem conservation and sustainable beekeeping practices. Adequate nectar and pollen resources are very important to maintain the health of honeybees. However, a shortage of both quantity and quality of pollen and nectar can lead to a decrease in the number of colonies that collect them (P. Lau et al. 2019 and U. Albuquerque et al. 2014). Melissopalynology offers a non-invasive method to analyze the pollen content of honey samples,

providing insights into the floral resources utilized by honeybee species. In this study, we aimed to utilize melissopalynology to identify the floral resources of *Apis florea* in Nagarkurnool district, Telangana, India. Thus, honey pollen analysis helps to understand the distribution and abundance of foraging sources in the region, which allows assessing the potential of the area for honey production at the commercial level (M. Sahney et al. 2018 and A. Vijaya Bhasker Reddy 2017).

MATERIALS AND METHODS

Several studies have demonstrated the utility of melissopalynology in honey codification and authentication. Louveaux, Maurizio, and Vorwohl (1978) presented methods and techniques for melissopalynological analysis, laying the foundation for this field of research.

Honey samples were collected from various mandals across Nagarkurnool district, Telangana, representing both summer and winter seasons. Nagarkurnool district lies between 16.487° or 16° 29' 13" of the north latitude and 78.3169° or 78° 19' 1" of the east longitude. The district shares boundaries with Nalgonda, Rangareddy, Mahabubnagar, Wanaparthy districts and with the state boundary of Telangana state with Nandyal, Palnadu and Prakasam Districts. A total of 16 honey samples were obtained, with four samples collected during the summer and the remaining from winter. Each honey sample was subjected to melissopalynological analysis using standard methods. This analysis involved the extraction of pollen grains from the honey samples using the acetolysis method (Erdtman, G 1960). Pollen grains

were identified and enumerated using light microscopy, and the relative abundance of each pollen type was recorded.

RESULTS AND DISCUSSION:

Analysis of the honey samples revealed the presence of pollen grains from multiple plant species. Among the identified pollen types, *Prosopis juliflora*, *Xanthium strumarium*, *Psidium guajava*, *Gymnosporia emerginata*, *Borassus flabellifer*, *Phoenix sylvestris*, and *Sapindus emarginatus* were found to be the chief floral resources for *Apis florea* in Nagarkurnool district (Table:1). These plant species are known to be abundant in the region and likely contribute significantly to the foraging activities of *Apis florea* during both summer and winter seasons.

S.No	Season	Village	Type of honey	Predominant pollen type	Habit
1	Winter	Marikal	Unifloral	<i>Prosopis juliflora</i>	Tree
2		Uyyalawada	Unifloral	<i>Xanthium strumarium</i>	Shrub
3		Rangapur	Unifloral	<i>Coriandrum sativum</i>	Herb
4		Vattem	Unifloral	<i>Psidium guajava</i>	Tree
5		Daserlapalle	Unifloral	<i>Sapindus emarginatus</i>	Tree
6		Jinkunta	Unifloral	<i>Gymnosporia emerginata</i>	Shrub
7		Yellur	Unifloral	<i>Dillenia pentagyna</i>	Tree
8	Summer	Janumpalle	Unifloral	<i>Phoenix sylvestris</i>	Tree
9		Gangupenta	Unifloral	<i>Borassus flabellifer</i>	Tree

Table:1 Showing unifloral honey resources during winter and summer seasons.

Pollen diversity in *Apis florea* honeys:

Herbs: *Alternanthera sessilis* (Amaranthaceae), *Amaranthus viridis* (Amaranthaceae), *Ageratum conyzoides* (Asteraceae), *Achyranthes aspera* (Achyranthaceae), *Blepharis maderaspatensis* (Acanthaceae), *Brassica nigra* (Brassicaceae), *Carum copticum* (Apiaceae), *Capsicum frutescens* (Solanaceae), *Croton bonplandianum* (Euphorbiaceae), *Celosia argentea* (Amaranthaceae), *Commelina benghalensis* (Commelinaceae), *Coriandrum sativum* (Apiaceae), *Evolvulus alsinoides* (Convolvulaceae), *Gyzotia abyssinica* (Asteraceae), *Imparata cylindrica* (Poaceae), *Justicia procumbens* (Acanthaceae), *Portulaca oleracea* (Portulacaceae), Poaceae type (Poaceae), *Rungia repens* (Acanthaceae), *Sida acuta* (Malvaceae) *Sphaeranthus indicus* (Asteraceae), Solanaceae type (Solanaceae), *Tridax procumbens* (Asteraceae), *Vernonia cinerea* (Asteraceae), *Xanthium strumarium* (Asteraceae), *Zea mayze* (Poaceae).

Shrubs: *Gymnosporia emarginata* (Celastraceae), *Cajanus cajan* (Fabaceae), *Crotalaria juncea* (Fabaceae), *Hyptis suaveolens* (Lamiaceae), *Ricinus*

communis (Euphorbiaceae), *Xanthium strumarium* (Asteraceae).

Trees: *Acacia nilotica* (Mimosaceae), *Azadirachta indica* (Meliaceae), *Borassus flabellifer* (Arecaceae), *Bombax ceiba* (Bombacaceae), *Citrus aurantifolia* (Rutaceae), *Clerodendrum inerme* (Verbenaceae), *Cocos nucifera* (Arecaceae), *Eucalyptus globulus* (Myrtaceae), *Feronia elephantum* (Rutaceae), *Holoptelea integrifolia* (Ulmaceae), *Lannea coromandelica* (Anacardiaceae), *Leucaena leucocephala* (Mimosaceae), *Muntingia calabura* (Elaeocarpaceae), *Prosopis juliflora* (Mimosaceae), *Prosopis specigera* (Mimosaceae), *Psidium guajava* (Myrtaceae), *Peltophorum pterocarpum* (Caesalpiniaceae), *Phoenix sylvestris* (Arecaceae), *Punica granatum* (Punicaceae), *Schleichera oleosa* (Sapindaceae), *Sapindus emarginatus* (Sapindaceae), *Terminalia arjuna* (Combretaceae), *Zizyphus mauritiana* (Rhamnaceae), *Zizyphus xylocarpa* (Rhamnaceae). **Climbers:** *Coccinia grandis* (Cucurbitaceae), *Capparis grandis* (Capparidaceae), *Tinospora cordifolia* (Menispermaceae) (Fig:1)

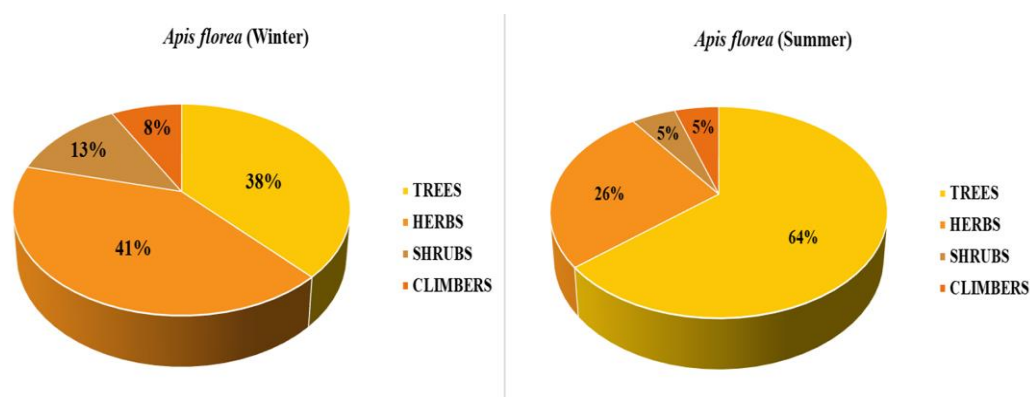


Fig:1 Composite spectrum of numerical frequency of Trees, Herbs, Shrubs and Climbers represented by their pollen in winter and summer honeys of *Apis florea*.

Discussion:

The identification of floral resources through melissopalynological analysis offers critical insights into the foraging behavior and dietary preferences of *Apis florea* in Nagarkurnool district. The detection of pollen grains from various plant species such as *Prosopis juliflora*, *Xanthium strumarium*, and *Psidium guajava* underscores the diverse floral landscape of the region. This diversity is essential for supporting the nutritional needs of *Apis florea*, reflecting their adaptability to the available flora and their reliance on a broad spectrum of plant species for foraging. The presence of numerous pollen types from herbs, shrubs, trees, and climbers in the honey samples highlights the importance of conserving these plant communities. Floral diversity not only supports the foraging activities of *Apis florea* but also contributes to the overall health and sustainability of bee populations. This is crucial as diverse pollen sources provide a balanced diet, enhancing the bees' immune systems and resilience to environmental stressors.

The analysis reveals significant seasonal variations in the foraging patterns of *Apis florea*. Herbaceous taxa are better represented in winter honeys (41%) compared to summer honeys (26%), indicating a seasonal preference or availability of these plants during the cooler months. Conversely, tree pollen types are more prevalent in summer honeys (64%) than in winter honeys (38%), suggesting that tree species provide critical floral resources during the warmer months. The consistent presence of climber pollen in both winter (8%) and summer (5%) honeys points to their year-round availability, albeit in smaller quantities. Shrub pollen, found in relatively low percentages, appears slightly more in winter (13%) compared to summer (5%), indicating a minor but noteworthy contribution to the bees' diet. Understanding these foraging patterns and

dietary preferences is pivotal for developing effective conservation strategies for *Apis florea*. The reliance on diverse floral resources throughout the year highlights the need to protect and conserve a wide range of plant species. Habitat conservation efforts should focus on maintaining the integrity of these plant communities to ensure the availability of essential floral resources.

Conclusion: Melissopalynology serves as a powerful tool for identifying floral resources utilized by *Apis florea* in Nagarkurnool district, Telangana, India. The presence of pollen grains from various plant species, including *Prosopis juliflora*, *Xanthium strumarium*, and *Psidium guajava*, indicates the diverse foraging preferences of this honeybee species. Conservation efforts aimed at preserving these floral resources are essential for maintaining healthy honeybee populations and promoting ecosystem resilience in the region. Further research exploring the seasonal dynamics and spatial distribution of floral resources could provide valuable insights into the foraging ecology of *Apis florea* and inform targeted conservation initiatives. The study indicates significant seasonal variations in the foraging patterns of *Apis florea*. Herbaceous taxa are better represented in winter honeys, while tree pollen is more prevalent in summer honeys. The consistent presence of climber pollen year-round, and the relatively low but notable presence of shrub pollen, reflect the bees' adaptive foraging strategies and the continuous availability of various floral resources.

Acknowledgements: The authors are grateful to local honey collectors, for their kind cooperation and support in the collection of honey samples. We are also thankful to Forest officials for their valuable suggestions and guidance during collection of honey samples from forest areas.


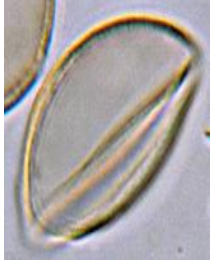

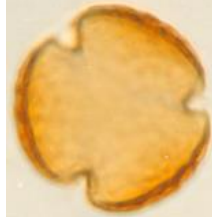


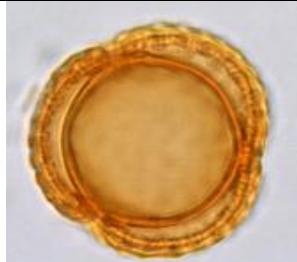

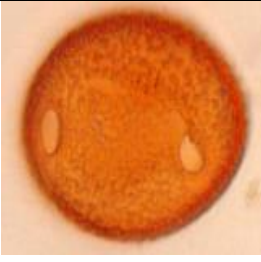
		
<i>Borassus flabellifer</i>	<i>Phoenix sylvestris</i>	<i>Coriandrum sativum</i>
		
<i>Prosopis juliflora</i>	<i>Gymnosporia emerginata</i>	<i>Sapindus emerginatus</i>
		
<i>Xanthium strumarium</i>	<i>Dillenia pentagyna</i>	<i>Alangium salvifolium</i>

Plate:1 Predominant pollen types of *Apis florea*

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