The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
20(3): S.I (3), 1250-1255, 2025 www.thebioscan.com

Insights into Pollinator Health and Sustainable Agriculture Inferences from Melissopalynological Investigation

Sneh Trivedi[1], Alka Srivastava[2]*

[1,2] Botany Department, Dayanand Girls P.G. College, Kanpur

***Corresponding Author:** Alka Srivastava

Email id: alka.srivastava72@gmail.com

DOI: 10.63001/tbs.2025.v20.i03.S.I(3).pp1250-1255

KEYWORDS
Honeybee, foraging, melissopalynology, pollen, sustainable agriculture

Received on:

04-08-2025

Accepted on:

08-09-2025

Published on:

07-10-2025

ABSTRACT

Melissopalynology, the analysis of pollen in honey, serves as a critical tool for understanding honeybee foraging dynamics and the botanical composition of honey across different ecological contexts. The present study investigates the seasonal variation in pollen composition of honey samples collected from eight agricultural landscapes in Kanpur and Unnao districts, Uttar Pradesh, India, encompassing areas viz. Rooma, Narwal, Shuklaganj, Dalhan, Barui, Asadhna, Saraiya, and Sarsaul. Pollen analysis was conducted using the Erdtman (1953) acetolysis method to detect pollen contents in honey samples. Results indicate a distinct temporal shift in pollen composition, with winter honey predominantly containing *Brassica campestris*, Solanaceae, *Coriandrum sativum*, and *Bombax ceiba*, signifying the critical role of *Brassica* sp. as a primary nectar source, to summer honey exhibiting dominance of *Syzygium* sp., *Helianthus* sp., Anacardiaceae, Poaceae, and Asteroideae, reflecting seasonal adaptation in honeybee foraging behavior. The findings underscore the significance of melissopalynology in elucidating pollinator-plant interactions, informing sustainable agricultural practices, and promoting biodiversity conservation. Furthermore, the study highlights the potential of melissopalynological analysis for assessing the impact of agricultural inputs and optimizing land management strategies. Longitudinal monitoring of pollen spectra in honey can provide valuable insights into the dynamic relationship between agricultural practices, pollinator health, and ecosystem stability.

INTRODUCTION

Melissopalynology, the study of the pollen composition of honey, provides valuable insights into the plant life that produces honey and the ecological context in which it is produced (Jamwal & Mattu, 2022; Monika Barth & da Luz, 2022). Because of the increasing knowledge about bees' foraging habits and the floral resources they use, this field has become a focal point of sustainable agriculture (Radaeski & Bauermann, 2021). The aim of this study is investigating the melissopalynology of honey samples gathered from various agricultural contexts in Kanpur and Unnao, districts, Uttar Pradesh, India. Seasonal variations and the prevalence of particular plant species are the main subjects of the study. Within the context of the continuing discussion regarding sustainable agriculture, the purpose of this research is to shed light on the intricate relationship that exists between honeybee eating patterns and the floral environment of the surrounding area.

The capacity of melissopalynology to offer a thorough comprehension of the botanical constituents of honey is one of its advantages, underscoring the significance of field for sustainable agriculture (Puścion-Jakubik et al., 2020). Through the intricate procedures of pollen collection, bees have direct interactions with the flowering plants that are within their foraging interest range. According to research by Azmi et al. (2015), melissopalynology offers valuable information about the ecological processes and biodiversity of a region (Saha et al., 2023).

The agricultural zones investigated include Rooma, Narwal, Shuklaganj, Dalhan, Barui, Asadhna, Saraiya, and Sarsaul areas of Kanpur and Unnao districts, Uttar Pradesh, India. These zones make up a complex ecosystem with a wide variety of floral resources. Honeybee colonies can produce honey with a variety of traits and personalities, depending on the particular flora in their environment. Melissopalynology is a useful method for categorising honey varieties according to their botanical origin (Majid et al., 2020). This is due to the fact that variability of honey is directly impacted by regional variations in floral sources.

This study used the standard acetolysis method for pollen analysis, which was developed by Erdtman (1953) and is in accordance with the commonly recognised practices in the field of melissopalynology. In order to study honey samples under a microscope, the method involves chemical treatment of the samples to eliminate organic content and release pollen grains (Hailu & Belay, 2020). It is possible to distinguish and quantify the different types of pollen using acetolysis. According to this method works well for removing pollen from honey samples. The current study ensures the reliability and comparability of its results with previous melissopalynological investigations by employing this consistent methodology.

Examining seasonal differences in honey composition, with an emphasis on the winter and summer, is the main goal of this study. *Helianthus* sp. and *Syzygium* sp. are the most common plant taxa during the summer, whereas *Brassica* and *Solanaceae* are more common during the winter. Honeybees can modify their behaviour to adapt to the different seasons by seeking out a range of flowering plants. As demonstrated by the research conducted by Jayadi & Susandarini (2020) , who found a range of melissopalynological patterns in honey produced during the various seasons on Lombok Island, Indonesia, helps us better understand the foraging behaviour of honeybees.

The results of melissopalynology can be drawn with broader implications for ecologically conscious agriculture (Tulu et al., 2023). Honeybees may play an important role in pollinating native plants, which serve as resources for mountain agro-ecosystems (Giupponi et al., 2022). We can better manage floral resources, which support honeybee populations and crop pollination, if we know which plants are found in honey from different agricultural locations (Ndlovu et al., 2023).

This introduction provides a summary of the reasons why melissopalynology is so significant for understanding honeybee foraging behavior, assessing floral resource availability, supporting sustainable agriculture, and informing conservation strategies for pollinators (de Souza et al., 2019). It emphasizes the role of melissopalynology in determining the botanical origins of honey and its significance for sustainable agriculture (Devender et al., 2019; Famuyiwa et al., 2020). Using the conventional acetolysis process and the selected agricultural regions in Kanpur and Unnao, the groundwork is laid for the subsequent sections of the research, providing observation, results, discussion, and conclusion. This is done in order to build the groundwork for the subsequent aspects of the research. Reviewing the relevant literature for which this research endeavor intends to contribute the existing body of knowledge concerning the subject of sustainable agriculture and melissopalynology in the Indian context.

MATERIAL AND METHOD

Honey Sampling Locations

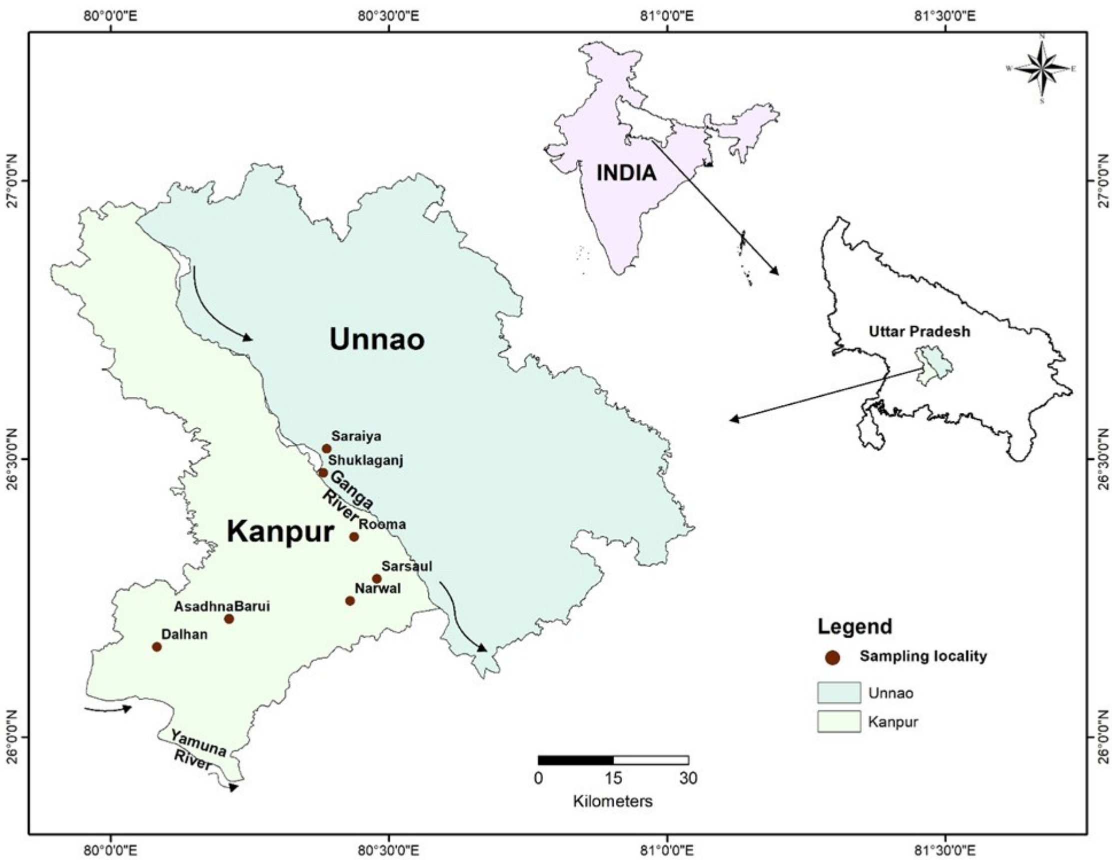

Fig. 1: Map illustrating the sampling locations of honey samples across agricultural landscapes in Kanpur and Unnao districts, Uttar Pradesh, India

A number of agricultural regions in Kanpur and Unnao districts of Uttar Pradesh, India, including Dalhan (26.1612°N, 80.0824°E), Asadhna (26.2117°N, 80.2123°E), Barui (26.212°N, 80.2126°E), Narwal (26.2441°N, 80.4299°E), Sarsaul (26.2839°N, 80.4779°E), Rooma (26.3592°N, 80.4369°E), Shuklaganj (26.4747°N, 80.3816°E) and Saraiya (26.5176°N, 80.3879°E) were in the geographic scope of study **(Fig.1)**. By documenting the diversity of floral resources and land use practices, the honey composition of the area can be better understood. These locations were chosen to collect honey from beehives placed across each site for a representative sample. Different beehives were selected within each region to account for any regional variations. Kanpur and Unnao were chosen because they are home to a diverse range of agricultural practices, which were documented in our study.

Laboratory Work

The conventional acetolysis procedure (Erdtman, 1953) was applied to the pollen examination of the honey samples. A total of 500–600 pollen spores were counted from each of the collected honey samples. The published literature (Basumatary, 2013; Basumatary et al., 2014; Bera et al., 2004; Chauhan & Murthy, 2010; Chauhan & Quamar, 2010; Ponnuchamy et al., 2014; Srivastava, 2022; Srivastava, 2022; Srivastava, 2021; Srivastava and Sharma, 2016; Tripathi et al., 2017; Trivedi et al., 2022; and Trivedi et al., 2025) was used to identify and characterise pollen spores. An Olympus BX-61 microscope equipped with a DP-25 digital camera was used to observe and photograph pollen spores under 40X magnification.

RESULTS

Winter Season Pollen Composition

The melissopalynological investigation found substantial seasonal variations in pollen composition in the selected agricultural areas of Kanpur and Unnao districts of Uttar Pradesh, India. The winter months saw the collection of honey samples from Rooma, Narwal, Shuklaganj, Dalhan, Barui, Asadhna, Saraiya, and Sarsaul.

Brassica campestris, Solanaceae, *Coriandrum sativum*, *Bombax ceiba*, Malvaceae, Asteroideae, *Lagerstroemia lanceolata*, and Poaceae **(Plate I)** are the main pollen constituents of honey samples in winter. Their dominance emphasises how crucial *Brassica* crops are to maintaining honeybee populations during the winter. *Brassica* sp. is usually grown in the winter and is a vital food source for bees when other flower supplies may be limited. Solanaceae is another important pollen component. The honeybees' diverse winter-feeding habits are demonstrated by pollen from plants in the Brassicaceae, Solanaceae, Malvaceae, Lythraceae, Apiaceae, Bombacaceae, Poaceae and Asteroideae families, which includes several winter-blooming species.

Summer Season Pollen Composition

When it comes to the summer pollen composition, the most prevalent contributors across all regions are *Helianthus* sp., *Syzygium* sp., Anacardiaceae, Poaceae, and Asteroideae **(Plate I)**, followed by a few to moderate amounts of *Acacia* sp. and Tagetes sp. *Helianthus* sp. is a vital summer crop giving honeybees pollen and nectar. The composition of honey in the summer is influenced by a wide variety of flowers besides *Syzygium* sp. The transition from *Brassica*-dominated winter honey to *Syzygium*-dominated summer honey demonstrates the dynamic nature of honeybee foraging strategies. In all regions, *Syzygium* sp. & *Azadirachta* sp. are the most common pollen type in the summer, indicating their significance as a floral resource for honeybees during this time. In the spring and summer, *Syzygium* sp. is an important plant for honeybee populations due to its steady dominance.

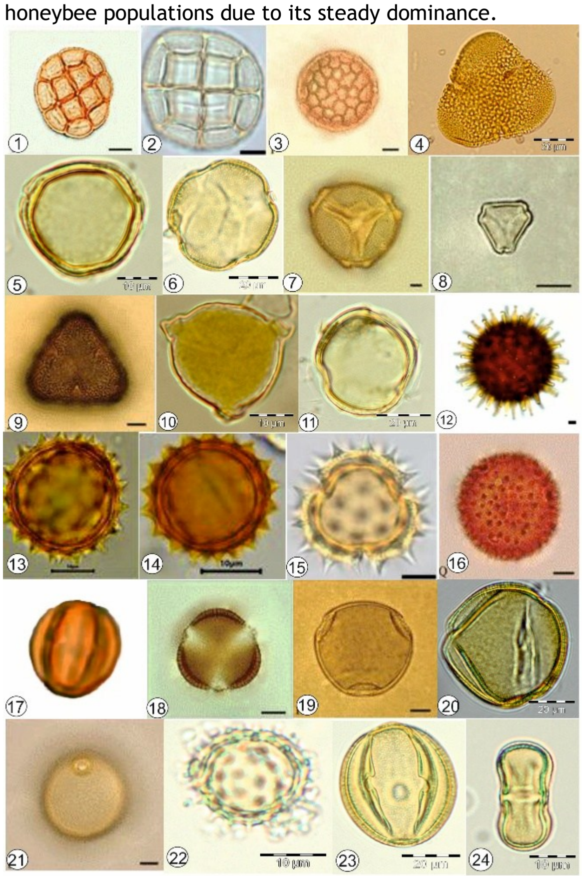

Plate I- Pollen plate depicting the morphological diversity of pollen taxa identified in honey samples: 1,2 *Acacia* sp.; 3.*Delonix regia*; 4. *Bombax ceiba*; 5. *Azadirachta indica*; 6. Convulvulaceae; 7,8. *Syzygium* sp.; 9. *Euphorbia* sp.; 10. *Eucalyptus citriodora*; 11. *Caesalpinia* sp.; 12. Malvaceae; 13,14. *Helianthus annus*; 15. *Tagetes* sp.; 16. *Sida acuta*; 17. *Lagerstroemia lanceolata*; 18. *Brassica campestris*; 19,20. Solanaceae; 21. Poaceae; 22. Asteroideae; 23. Anacardiaceae; 24. *Coriandrum sativum*

DISCUSSION

Melissopalynological analysis of honey samples collected from various agricultural areas of Kanpur and Unnao districts of Uttar Pradesh, India, revealed different plant species which honeybees feed upon. The predominance of *Brassica* pollen during the winter months highlights the significance of winter crops such as mustard and Solanaceae plants in maintaining honeybee populations. Not only can Brassica crops provide honeybees with nectar and pollen, but they also serve as important oilseed sources for edible oils and as nutrient-rich fodder for livestock. The summertime abundance of *Syzygium* sp. pollen further emphasizes role of sunflower as an important food source. During the warmer months, honeybees are drawn to *Syzygium* sp. due to their abundance of pollen and nectar. Consistent with what is known, various plant species sustain honeybee foraging activities at different times of the year. The impact of agricultural practices on honey composition can be inferred from the reported differences in pollen composition across seasons and geographies. Honeybees may have a harder time finding food in agricultural environments that are monoculture or have few flower varieties. Because these crops are so common in the surrounding agricultural areas, it is possible that they dominate certain seasons. For example, in winter, *Syzygium* sp. is dominant, while in winter, *Brassica* sp. is dominant.

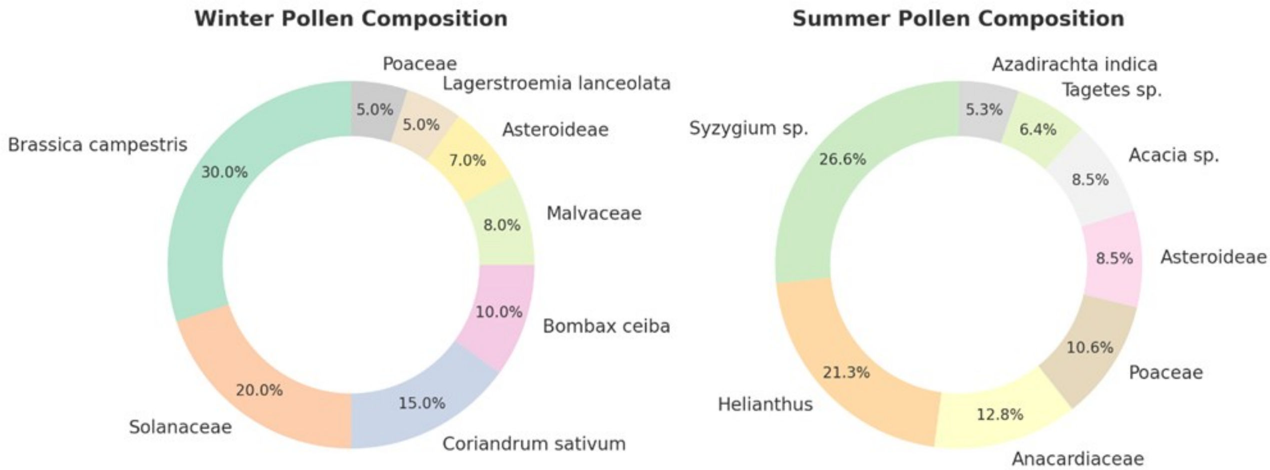

Fig. 2: Comparative analysis of winter and summer pollen showing the relative abundance (%) of dominant pollen taxa in honey samples

The melissopalynological analysis of winter honey revealed a strong dominance of *Brassica campestris*, which accounted for 30% of the total pollen spectrum. This dominance indicates the abundance and accessibility of mustard flowers during the winter flowering season in the study area. In addition to *Brassica campestris*, the family Solanaceae contributed a substantial proportion (20%), reflecting its widespread presence and attractiveness to foraging honey bees during this period.

Another notable contributor to the winter honey spectrum was *Coriandrum sativum*, which represented 15% of the pollen assemblage. The presence of this economically important crop plant suggests that honey bees extensively utilized cultivated fields as foraging grounds. Likewise, *Bombax ceiba* accounted for 10% of the composition, further highlighting the availability of large-flowered tree species that provide nectar and pollen resources in winter. Together, these taxa underscore the significant role of both cultivated crops and native tree species in shaping the winter foraging profile.

Minor but ecologically important contributions in winter were derived from Malvaceae (8%), Asteroideae (8.5%), *Lagerstroemia lanceolata* (5%), and Poaceae (5%). Although these groups individually contributed lower percentages, they collectively indicate a diversified floral spectrum supporting honey bees during the lean flowering season. The inclusion of both arboreal and herbaceous taxa demonstrates the resilience of bees in utilizing a wide array of plant resources.

In contrast, the summer honey composition exhibited a comparatively more diverse floral profile. The spectrum was dominated by *Syzygium* sp. (26.6%) and *Helianthus* (21.3%), both of which are prolific summer bloomers offering abundant nectar and pollen rewards. Anacardiaceae (12.8%) and Poaceae (10.6%) also contributed significantly, highlighting the role of fruiting trees and grasses in summer foraging. Minor but consistent shares were represented by Asteroideae (8.5%), *Acacia* sp. (8.5%), *Tagetes* sp. (6.4%), and *Azadirachta indica* (5.3%) **(Fig. 2).** This composition suggests that summer honey production is supported by a broader range of floral resources, encompassing few other trees, shrubs, and herbaceous plants. The diversity of pollen taxa in summer underscores the adaptability of honey bees in exploiting seasonally available flora, ensuring colony sustainability and honey production.

The variety and quality of honeybees' floral resources can be impacted by intensive agricultural practices, such as the usage of herbicides and pesticides. The quality of honey and the well-being of honeybee colonies, both are threatened by the possibility of pesticide residue contamination. A varied and uncontaminated forage base can have a favorable effect on honey composition through the use of sustainable agriculture practices that value biodiversity, minimize chemical inputs, and protect natural ecosystems. Melissopalynology sheds light on the botanical roots of honey, making it a useful tool for sustainable agricultural management. Decisions about land management can be informed by the identification of important plant species in honey. Designing landscapes that promote pollinator health requires knowledge of floral resources which honeybees prefer. Honeybees can benefit from an increase in forage resources by reducing monoculture and increasing diversity in flowering plant communities. One delicate way to gauge the state of the ecosystem is through melissopalynology. Beehive composition shifts could be a result of changes in land usage, new crop introductions, or the influence of environmental stresses. If melissopalynological analysis is routinely performed, it can detect changes in the ecological balance early on and help direct efforts to lessen their negative impact.

Policies that priorities the protection of pollinators can be influenced by the knowledge acquired from melissopalynology. Policymakers can take action to protect honeybee foraging habitats by designating areas as protected, encouraging agroecological practices, and controlling pesticide use, among other things. Bees perform pollination services, which are essential to sustainable agriculture. Crops that are good candidates for bee pollination can be better chosen and managed with the use of melisma-palynological insights into preferences of honeybee. Crop diversification methods that aim to enhance resilience and production can benefit greatly by this information. Recognizing the interdependence of honeybee foraging, floral resources, and agricultural practises is crucial in the context of sustainable agriculture (Peshin et al., 2022). A more comprehensive approach to land management is required, as this study shows how honeybees' preferences for particular plant species change with the seasons. Forage for honeybees can be ensured all year round by increasing flower diversity in and around agricultural areas. A mosaic of flower resources that promote honeybee health can be created by combining cover crops, hedgerows, and wildflower strips. Keeping the forage area clean for honeybees requires reducing the use of herbicides and insecticides. One way to lessen the amount of agrochemicals in honey is to use integrated pest management strategies or organic farming methods. The diversity of the ecosystem that honeybees rely on depends on the preservation of natural habitats including woods, meadows, and waterbodies. The availability of diverse floral resources depends on the preservation of these habitats. Sustainable practices can only be advanced through cooperation between farmers and beekeepers. In order to promote sustainable land management, it is important to educate farmers on the significance of honeybee foraging, the function of particular plant species, and the possible consequences of agricultural practices.

Finally, Melissopalynology provides practical insights for sustainable farm management in addition to expand our knowledge of honey composition. Together lawmakers, farmers, and beekeepers may help, preserve honeybee numbers and promote sustainable agricultural practises by incorporating melissopalynological results into land management decisions.

CONCLUSION

Honey samples collected from various agricultural areas in Kanpur and Unnao districts of Uttar Pradesh, India have been subjected to palynological analysis, providing important information regarding honeybee foraging habits and the plants that contribute to honey with its natural sweetness. According to the research, pollen composition varies significantly throughout the year. In winter, *Brassica* sp. is more common in honey samples, while *Syzygium* sp. is common in summer. So, *Brassica* sp. and *Syzygium* sp. are the crops upon which honeybees consistently relied upon, regardless regional variances. The result can impact the ramifications for environmentally responsible farming areas. The significance of enhancing biodiversity in agricultural environments is highlighted by the identification of important plant species. Supporting honeybee populations and overall ecosystem resilience, farmers can cultivate pollinator-friendly habitats by growing a varied array of flowering plants, such as wildflower strips and cover crops.

The study also draws attention to the fact that agricultural practices may alter the composition of honey. The quantity and quality of nectar and pollen supplies available to honeybees could be affected by pesticide usage and intensive monoculture. Consequently, a vital tactic for environment responsible farming is to implement land management practices that put pollinator health first, such as decreasing pesticide inputs and protecting natural habitats. Agricultural practices in Kanpur and Unnao districts of Uttar Pradesh, India, might be guided by the practical uses of melissopalynology. Areas with significant floral diversity can be designated as pollinator-friendly zones with the use of specific plant preferences data included into land use planning. Also, melissopalynology can be used to analyze honey samples for agrochemical residues, which can help us understand how pesticides could affect honeybee health and how to manage pesticides in a way that doesn't harm pollinators. Honey composition dynamics over the seasons can teach us a thing or two about crop management. Using melissopalynological data, farmers can diversify and rotate their crops in a way that maximizes the benefits of bee pollination by timing their plantings according to honeybee foraging patterns. Farmers, beekeepers, and agricultural extension agency awareness-raising campaigns must incorporate into melissopalynology findings. There is a strong correlation between the well-being of pollinators and agricultural output, and this correlation can only grow if people learn more about the complex web of relationships between bees and farming. To further enhance our knowledge of honeybee feeding dynamics and the changing effects of agricultural practices, it is crucial to continue melissopalynological research in Ganga Plain. Honey bee foraging habits and honey composition reveal changes that strike a balance between environmental integrity and productivity, which promotes sustainable agriculture.

Acknowledgement

We express our sincere gratitude to the Principal, Dayanand Girls' PG College, Kanpur, and the Director, Birbal Sahni Institute of Palaeosciences, Lucknow, for providing the necessary facilities and support to successful completion of this work. Sneh Trivedi is deeply thankful to the University Grants Commission (UGC) for their financial assistance under the Savitribai Jyotirao Phule Single Girl Child Fellowship scheme.

REFERENCES

- Azmi, W. A., Zulqurnain, N. S., & Ghazi, R. (2015). Melissopalynology and foraging activity of stingless bees, *Lepidotrigona terminata* (Hymenoptera: Apidae) from an apiary in Besut, Terengganu.
- Basumatary, S. K. (2013). Ultrastructure of pollen grains and their role in melissopalynology. *Indian Journal of Palynology, 42*(1), 75–88.
- Basumatary, S. K., Murthy, S., & Bera, S. K. (2014). Modern pollen spectra from Chamrajnagar District of Karnataka, India. *Journal of Palaeosciences, 63*(1-2)), 87-91.
- Bera S, Dixit S, Basumatary S, Sarma GC. (2004). Pollen analysis of honey from Kamrup Reserve forests, Assam. *Palynology* 43: 57–65.
- Chauhan, M. S., & Murthy, S. (2010). Melittopalynological investigation of honeys from Chamarajanagar District, southern Karnataka, India. *Geophytology, 39*(1-2), 41-47.
- Chauhan, M. S., & Quamar, M. F. (2010). Pollen analysis for honey authentication. *Pollen Research International, 29*(4), 145–160.
- de Souza, R. R., de Abreu, V. H. R., & de Novais, J. S. (2019). Melissopalynology in Brazil: A map of pollen types and published productions between 2005 and 2017. *Palynology, 43*(4), 690-700.
- Devender, R., Ramakrisha, H., & Niranjan, S. (2019). Melissopalynological analysis of honeys from Paderu forest division of Visakhapatnam district in Andhra Pradesh, India. In *Modern Beekeeping-Bases for Sustainable Production*. IntechOpen.
- Erdtman, G. (1953). *Pollen morphology and plant taxonomy: Angiosperms*. Almqvist & Wiksell.
- Famuyiwa, S. O., Anikwe, J. C., Adeonipekun, P. A., & Adebayo, M. (2020). Proximate, mineral and melissopalynological analyses of honeys produced by *Apis mellifera adansonii* maintained at the University of Lagos Apiary. *Journal of Tropical Resources and Sustainable Science (JTRSS), 8*(2), 78-85.
- Giupponi, L., Leoni, V., Gianoncelli, C., Tamburini, A., & Giorgi, A. (2022). Endemic plants can be resources for mountain agro-ecosystems: The case of *Sanguisorba dodecandra* Moretti. *Sustainability, 14*(11), 6825.
- Hailu, D., & Belay, A. (2020). Melissopalynology and antioxidant properties used to differentiate *Schefflera abyssinica* and polyfloral honey. *PLOS ONE, 15*(10), e0240868.
- Jamwal, R., & Mattu, V. K. (2022). Melissopalynological determination of pollen density and botanical origin of autumn honeys of Kullu Hills, Himachal Pradesh, India. *Indian Journal of Agricultural Research, 56*(4), 381-388.
- Jayadi, L. Z., & Susandarini, R. (2020). Melissopalynological analysis of honey produced by two species of stingless bees in Lombok Island, Indonesia. *Nusantara Bioscience, 12*(2).
- Majid, M., Ellulu, M. S., & Abu Bakar, M. F. (2020). Melissopalynological study, phenolic compounds, and antioxidant properties of *Heterotrigona itama* honey from Johor, Malaysia. *Scientifica, 2020.*
- Monika Barth, O., & da Luz, C. F. P. (2022). Melissopalynology in Brazilian restinga areas, a mini review. *Grana, 61*(5), 355-365.
- Ndlovu, N., Neumann, F. H., Henley, M. D., Cook, R. M., & Reynolds, C. (2023). Melissopalynological investigations of seasonal honey samples from the Greater Kruger National Park, Savanna biome of South Africa. *Palynology, 2179679.*
- Peshin, R., Kaul, V., Perkins, J. H., Sood, K. K., Dhawan, A. K., Sharma, M., ... & Zaffar, O. (Eds.). (2022). Sustainable agricultural innovations for resilient agri-food systems. *Applied Science and Technology, 25*(3), 1-8.
- Ponnuchamy, S., et al. (2014). Pollination ecology and honey bee foraging patterns. *Ecological Studies Journal, 22*(1), 35–48.
- Puścion-Jakubik, A., Socha, K., & Borawska, M. H. (2020). Comparative study of labelled bee honey from Poland and the result of the melissopalynological analysis. *Journal of Apicultural Research, 59*(5), 928-938.
- Radaeski, J. N., & Bauermann, S. G. (2021). Contributions to melissopalynology studies in southern Brazil: Pollen analysis in the honeys from *Apis mellifera, Tetragonisca*

angustula, Melipona quadrifasciata quadrifasciata, Scaptotrigona bipunctata, Plebeia remota, and *Plebeia droryana*. *Palynology, 45*(3), 477-486.

- Saha, S., Nath, R., Dey, A., Laskar, N., & Kundu, A. (2023). Melissopalynological analysis of *Apis* honey from northern districts of West Bengal. *Grana, 1*-17.
- Srivastava A. (2022). Pollen morphology of some plants of subfamily Caesalpinioideae: A contribution to Quaternary pollen identification. Indian Journal of Archaeology, Vol. 7(2):1-13. (ISSN: 2455-2798)
- Srivastava A. (2022). Pollen key and Morphological Characters of Some Plants of Subfamily Mimosoideae: Implications for Environmental Archaeology. Indian Journal of Archaeology, Vol. 7(1): 1884-1887. (ISSN: 2455-2798)
- Srivastava A. (2021). Identifying pollen characters of Subfamily Papilionoideae under light microscopy: An aid to archaeological sediment study. Indian Journal of Archaeology, Vol. 6(4): 1961-1967. (ISSN: 2455-2798)
- Srivastava, A., & Sharma, S. (2016). Pollen morphology of some cultivated cucurbits of Ganga Plain. *Geophytology*, *46*(1), 15-23.
- Tripathi S, Basumatary SK, Bera SK, Brahma M, Sarma GC. (2017). A Palynological study of natural honeys from the Bongaigaon district of Assam, northeast India. Palynology 41(3):389-400.
- Trivedi, A., Srivastava, A., Farooqui, A., Khan, S., Pokharia, A. K., Ferguson, D. K., & Singh, V. K. (2022). Pollen morphological study in subfamily Papilionoideae using Confocal Laser Scanning Microscopy. *Journal of Palaeosciences*, *71*(2), 123-142.
- Trivedi, S., Srivastava, A., Basumatary, S. K., & Pokharia, A. K. (2025). Seasonal nectar sources and pollen-vegetation relationship in densely vegetated ecosystems of the Gangetic Plain, Uttar Pradesh, India. *Journal of the Palaeontological Society of India*, 05529360251339874.
- Tulu, D., Aleme, M., Mengistu, G., Bogale, A., Bezabeh, A., & Mendesil, E. (2023). Melissopalynological analysis and floral spectra of *Apis mellifera scutellata* Lepeletier bees in different agroecologies of southwest Ethiopia. *Heliyon, 9*(5).