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Relative Abundance of Pollinators in Guava under Subtropical Conditions

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ABSTRACT: This study assessed the pollinator fauna of guava (*Psidium guajava*) plantations at ICAR-CISH, Lucknow during the 2024 rainy and winter flowering seasons. Weekly field observations were conducted from 10% flowering until completion, recording pollinator visitation rates and relative abundance across different times of the day. *Apis dorsata* emerged as the dominant pollinator, with an average of 65.76 visits per five flowers per five minutes (33.19% relative abundance) during the rainy season, increasing to 74.56 visits (44.47%) in winter. *Apis cerana indica* and *Ceratina* spp. were the next most abundant species. Peak activity occurred between 6:10–8:45 AM and 4:00–5:15 PM. The findings highlight the significance of native bee species in guava pollination under intensive cultivation systems.

Keywords: Guava (*Psidium guajava*), Pollinator fauna, *Apis dorsata*, *Apis cerana indica*, *Ceratina* spp.

INTRODUCTION

Pollination is a fundamental ecological process essential for the reproduction of flowering plants, supporting biodiversity and food security (Omar *et al*., 2021). About 87% of flowering plants and 87 of the leading global food crops rely on pollinators for seed production (Brunet and Fragoso 2024). Insect-mediated pollination significantly enhances the productivity and quality of many fruit crops, including guava (*Psidium guajava* L.), a nutritionally rich tropical fruit (Vinod and Sattagi 2018; Omar *et al*., 2021). Guava, enriched with citric acid, minerals, and vitamin C, ranks as the fourth most cultivated fruit in India, with a production of 5.59 million metric tonnes in 2023. Due to the flower morphology, where the stigma protrudes above the anthers, self-pollination is rare in guava (Pommer and Murakami 2009). Approximately 35–40% of pollination is facilitated by insect vectors, improving fruit set and quality (Singh, 2020). Key pollinators include *Apis dorsata*, *Apis cerana indica*, and *Apis florea*, while Diptera and Lepidoptera contribute to a lesser extent (Vinod and Sattagi 2018; Singh and Thakur 2017). Pollinator activity varies with environmental factors, typically peaking in early morning and late afternoon under subtropical climates. However, the decline of pollinators due to chemical-intensive agriculture threatens this vital service. This study aims to document the diversity and relative abundance of guava pollinators under subtropical conditions.

MATERIALS AND METHODS

The study was conducted in the guava plantation (var. Shweta) of ICAR-CISH, Lucknow. Field observations were carried out over two consecutive flowering seasons during the rainy season (April-May) and winter season (October-November) of 2024. Guava trees of the same age (7-10 years) and with similar canopy growth were selected for the study. Observations on pollinator visitation began when flowering reached 10%. Since anthesis starts at 4:00 AM and lasts until 10:00 AM in guava trees, data collection took place at 06:00 AM, with observations lasting five minutes on five randomly chosen flowers from five randomly selected trees. These observations were recorded weekly until flowering was complete. Representative samples of each pollinator species observed during the study were collected, preserved, and identified. The identified species were counted, averaged, and categorized by order to analyze the pollinator fauna associated with guava. Additionally, data on the relative abundance of pollinators were collected at 10% flowering by recording visits from various pollinator groups at 8:00 AM, 10:00 AM, 12:00 PM, 2:00 PM, and 4:00 PM. Observations were made on five randomly selected flowers from five trees for five minutes at each time point. The relative abundance of different pollinator species was calculated using a specific formula and expressed as a percentage.

Relative abundance of species = (Number of insect species visited/ total numbers of pollinators visited)/100

RESULTS AND DISCUSSION

Different pollinator species were identified as, *Apis dorsata*, *Apis cerana indica*, *Ceratina* spp., *Xylocopa* spp., *Tetragonula iridipennis*, *Danaus* spp. Table 1 indicate the pollinator fauna in guava ecosystem during two consecutive flowering seasons of 2024. During April-May (rainy season guava), average number of *Apis dorsata* per 5 flower/ 5 min was about 65.76 with relative abundance of 33.19%. Whereas, during Sep-

Oct (winter season guava), average number per 5 flower/ 5 min was about 74.56 with relative abundance of 44.47%. During April-May (rainy season guava), average number of *Apis cerana indica* per 5 flower/ 5 min was about 55.87 with relative abundance of 28.20%. Whereas, during Sep-Oct (winter season guava), average number per 5 flower/ 5 min was about 49.77 with relative abundance of 27.12%. Overall pooled data indicated that over two seasons, *Apis dorsata* visited in highest number (70.16) / 5 flowers/ 5 minutes followed by *Apis cerana indica* Fab. (49.77) and *Ceratina* spp. (34.67). The transit time period of the visitors were found during 6.10 AM - 8.45 AM and 4.00 PM -5.15 PM. The foraging speed and transit time of all flower visitors have been studied.

(a) (b) (c)

Fig. 1. (a) *Apis dorsata*, (b) *Apis cerana indica* and (c) *Ceratina* spp. pollinating guava flowers.

Table 1: Pollinator fauna in guava ecosystem during April-May, Sep-Oct of 2024.

Sr. No.	Sc. Name	Family: Order	April-May		Sep-Oct		Pooled	
			Number/5 flowers /5 min	Relative abundance (%)	Number/5 flowers /5 min	Relative abundance (%)	Number/5 flowers /5 min	Relative abundance (%)
1.	*Apis dorsata* Fab.	Apidae: Hymenoptera	65.76	33.19	74.56	44.47	70.16	38.83
2.	*Apis cerana indica* Fab.	Apidae: Hymenoptera	55.87	28.2	43.67	26.04	49.77	27.12
3.	*Ceratina* spp.	Apidae: Hymenoptera	43.78	22.09	25.56	15.24	34.67	18.66
4.	*Xylocopa* spp.	Apidae: Hymenoptera	20.14	10.16	10.4	6.2	15.27	8.18
5.	*Tetragonula iridipennis* Smith	Apidae: Hymenoptera	8.87	4.47	13.45	8.02	11.16	6.25
6.	*Danaus* spp.	Nymphalidae: Lepidoptera	3.7	1.87	0	0	1.85	0.93
7.	Flies	Diptera	-	-	-	-	-	-

The present study revealed that *Apis dorsata* was the dominant pollinator in guava during both flowering seasons, followed by *Apis cerana indica* and *Ceratina* spp. Similar dominance of Hymenopteran pollinators, particularly *Apis* species, has been previously reported under various cultivation systems (Vinod and Sattagi 2018; Singh, 2020). The peak period of anther dehiscence in guava occurred between 7:30 and 9:30 AM (Sandhu *et al*., 2024). This explains why higher visitation rates were observed during the early morning and late afternoon, aligning with the findings of Singh and Thakur (2017), who emphasized the importance of optimal foraging windows for maximizing pollination efficiency. The greater relative abundance of *Apis dorsata* during the winter season suggests better adaptation of this species to cooler conditions, corroborating observations by Omar *et al*. (2021) regarding seasonal variation in pollinator activity. The role of native bees like *Apis dorsata* in supplementing guava pollination aligns with the broader findings on wild pollinators significantly enhancing crop yields, even in the presence of managed honey bees (Garibaldi *et al*., 2013). Furthermore, floral resource availability and foraging behavior, as discussed in African and Indian contexts (Sande *et al*., 2009; Basu *et al*., 2011), reinforce the temporal patterns observed in this study. Although *Tetragonula iridipennis* and *Xylocopa* species were present, their contribution to overall pollination was comparatively lower, which is consistent with earlier reports emphasizing the marginal role of non-*Apis* species in guava pollination (Vinod and Sattagi 2018). Since *A. dorsata* is a wild and non-domesticated species, the augmentation of pollination via *A. cerana indica* need to be investigated further. Declines in dipteran and lepidopteran visitors during the flowering seasons may be attributed to habitat disturbance and agricultural intensification, factors also noted by Omar *et al*. (2021). Although guava is capable of self-pollination, insect pollination plays a crucial role in enhancing fruit yield and quality (Sharma and Abhishek 2025).

CONCLUSION AND FUTURE SCOPE

The findings underscore the critical role of native bee species in sustaining guava productivity and reinforce the need for pollinator-conserving agronomic practices. The study highlights the predominance of *Apis dorsata* as a major pollinator of guava under subtropical conditions, followed by *Apis cerana indica* and *Ceratina* spp. Being well domesticated, *A. cerana indica* offers potential for developing apiculture within the guava ecosystem of this area. The observed pollination dynamics emphasize the vital role of native bees in sustaining guava production. Promoting pollinator-friendly practices is essential to conserve these key species and ensure stable fruit yield in guava.

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Conflict of Interest. None.

REFERENCES

Basu, P., Bhattacharya, R. and Chakraborty, P. (2011). Insect pollinators of cultivated crops: A review. *Resonance*, *16*(9), 821–833.

Brunet, B. and Fragoso, F. P. (2024). What are the main reasons for the worldwide decline in pollinator populations?. CABI Reviews *19*, 1.

Garibaldi, L. A., Steffan-Dewenter, I. and Winfree, R. (2013). Wild pollinators enhance fruit set of crops regardless of honey bee abundance. *Sci*., *339*(6127), 1608–1611.

Omar, N. A., Zariman, N. A. and Huda, A. N. (2021). Pollination in the Tropics: Role of Pollinator in Guava Production. *Int. J. Life Sci. Biotech*., *4*(3), 623–639.

Pommer, C. V. and Murakami, K. R. N. (2009). (Eds. Jain SM and Priyadarshan PM), Breeding Guava (*Psidium guajava* L.) Breeding plantation tree crops: tropical species, Springer Science, pp.83-120.

Sande, S. O., Crewe, R. M., Raina, S. K. and Nicolson, S. W. (2009). Floral rewards and foraging behaviour of honeybees on African guava (*Psidium guajava* L.) trees. *Afri. J. Eco.*, *47*(4), 499–507.

Sandhu, M. S., Kaur, R. and Bal, J. S. (2024). Studies on floral bud development and flowering behavior of guava (*Psidium guajava* L.). *Int. J. Pharm. Pharmaceu. Sci*., *6*(1), 38-43.

Sharma, P. and Abhishek, T. S. (2025). The Hidden Helpers: Pollinators and their Impact on Guava Crops. *Vigyan Varta.*, *6*(2), 105-108.

Singh, A. K. and Thakur, R. K. (2017). Estimation of optimal pesticide application time on guava (*Psidium guajava*) based on temporal foraging activity of pollinators. *Ind. J. Ecol.*, *44*(2), 375–378.

Singh, A. K. (2020). Comparative performance of various pollinators in guava. *Ind. J. Hort.*, *77*(1), 206–209.

Vinod, M. and Sattagi, H. N. (2018). Pollinator fauna and their relative abundance in guava under organic and conventional farming systems. *J. Exp. Zool.*, *21*(2), 1173–1179.

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