BUTTERFLY-WILD NECTAR PLANT INTERACTIONS AND DNA BARCODING OF THESE PLANTS IN BANGLADESH

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ABSTRACT

Wild nectar-bearing plants play a vital role in supporting pollinators including butterflies by providing them with carbohydrate-rich nectar, thus contributing significantly to the stability of local ecosystems. The Jahangirnagar University (JU) campus functions as a semi-natural habitat, supporting a rich diversity of pollinators. This includes 60 butterfly species, which thrive with the support of 54 wild nectar-producing plant species from 30 distinct families. Among the plant families, the Asteraceae was the most represented, with 11 species, followed by Acanthaceae and Verbenaceae, each with 4 species. Other families included Fabaceae, Malvaceae, Solanaceae, Rubiaceae, Cleomaceae, Lamiaceae, Oxalidaceae and Tiliaceae each contributed two species, while the remainder families contributed one species each. In addition, floral traits such as corolla type and flower color were examined also to explore their relationship with butterfly. On the other hand, the campus was divided into 10 study sites, with the highest plant diversity (49 species) recorded near the Adjoining Swimming Pool (Site 8) and the lowest (28 species) near the Adjoining Statistics Department (Site 5). In the present study, 6 of the 54 selected plant species were processed for DNA barcoding using the matK gene, with the remaining 48 to be analyzed in the next phase. BLAST analysis showed 99.75–100% similarity with GenBank entries, validating the effectiveness of this gene for plant species identification. This molecular study is a stepping stone in refining DNA barcoding as a method for broader application to all 54 plant species. Nonetheless, this study not only provides insight into plant-butterfly associations but also advocates for the integration of molecular techniques in biodiversity assessments, enhancing our ability to accurately identify and monitor plant-pollinator relationships in natural habitats.

KEYWORDS: Butterfly, Nectar plant, matK, Identification, Jahangirnagar University

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Introduction

Butterflies are vital indicators of ecological health, playing significant roles in pollination and serving as bioindicators of environmental change. Butterfly population conservation is closely tied to the availability and diversity of native nectar plants, which provide essential resources for adult butterflies (Tallamy, 2007). Jahangirnagar University campus (JU campus), a semi-natural campus, was once part of a large deciduous Sal forest. Now, the original forest has been replaced by secondary vegetation and plantations (Khan *et al*., 2021). The campus also has many nectar plants that support a large population of pollinators including butterflies. The identification and inventory of these nectar plants is crucial for understanding the ecological dynamics that sustain local butterfly populations.

Among the 421 butterfly species documented in Bangladesh, 110 were found on this campus (IUCN-Bangladesh, 2015; Hossain, 2023). However, the current count of butterfly species in JU campus has declined to 72, recent destructive as well as constructive activities may damage their habitat at an alarming rate (Tonmoy *et al*., 2024). Butterfly availability depends on both nectar-providing plants and larval host plants (Sankaranarayanan *et al*., 2018). On the JU campus, Khan *et al*. (2021) documented 917 vascular plant species belonging to 574 genera and 145 families, of which 70.34% are wild and the rest cultivated or planted. However, their study did not specify which of these species serve as nectar sources or larval host plants, highlighting a critical gap in understanding butterfly-plant interactions on the campus. Moreover, a recent checklist of butterfly larval host plants on the JU campus, Bangladesh, documented 107 plant species supporting over 72 butterfly species for egg laying (Das *et al*., 2025). These findings are vital for informing effective butterfly conservation strategies in Bangladesh, including at JU campus. However, the absence of dedicated nectar-providing plants on the campus highlights a critical gap. By identifying key wild nectar sources and mapping their distribution, this study emphasis on the need for habitat restoration and the protection of wild plant species to sustain butterfly populations in both natural and urban settings. These regions frequently act as sanctuaries for species in the face of growing urbanization. Recording the variety and spread of these plants on the JU campus not only aids in the preservation of butterflies, but also deepens the overall comprehension of the relationships between plants and pollinators in this particular setting (Nimbalkar *et al*., 2011).

Moreover, in the context of butterfly conservation, accurate identification of nectar-providing plants is essential for understanding pollinator-plant interactions and developing effective habitat management strategies. While traditional morphological methods remain valuable, they often face limitations due to the presence of cryptic species, seasonal variations and morphometric ambiguities, especially among closely related or poorly described wild plant species (CBOL Plant Working Group, 2009). To overcome these challenges and enhance the precision of plant identification, this study incorporates DNA barcoding using the matK gene, a widely accepted marker for plant species authentication (Hollingsworth *et al*., 2009). DNA barcoding offers a reliable, complementary approach to traditional taxonomy, allowing for the accurate identification of nectar plants that are otherwise difficult to distinguish morphologically. In the context of the JU campus, an ecologically diverse region experiencing rapid environmental changes, this molecular approach not only helps confirm species identity but also lays the foundation for a robust and scalable biodiversity monitoring system. By applying DNA barcoding to selected wild nectar plants, the study ensures that conservation efforts are grounded in scientifically validated data, ultimately supporting the sustainability of butterfly populations and their native habitats in Bangladesh (Hebert *et al*., 2003; Das *et al*., 2025).

This study aims to inventory the wild nectar plants that support butterflies on the JU campus. The findings will provide insights into the conservation needs of both the butterflies and their habitats, offering guidance for future ecological management practices. By focusing on wild species, the research emphasizes the importance of preserving indigenous flora, which is vital for maintaining ecological balance and supporting local biodiversity like JU campus.

Materials and Methods

Ethical approval

No ethical approval was necessary for the conduct of this study.

Study area

The campus is located in Savar, Dhaka, Bangladesh, between the coordinates 23.8671°-23.8977°N and 90.2588°-90.2731°E (Figure 1). We divided the studied area into ten different sites: Bishmile (S1), JU School and College (S2), VC Lake (S3), Old Arts Building (S4), Adjoining Statistics Department (S5), Adjoining Chemistry Department (S6), Butterfly Park and Research Center (S7), Adjoining Swimming Pool (S8), Adjoining Mir Mosharraf Hossain Hall (S9) and JU Botanical Garden (S10) (Figure 1).

Data collection and validation

Wild-nectar plants of butterfly species were recorded by employing Visual Count Method (VCM) during nectar-feeding events along systematic transect walks within the Jahangirnagar University (JU) campus (Shirisha *et al*., 2024). Surveys were conducted from January 2024 to June 2025, covering seasonal variation. Transects were surveyed repeatedly with standardized walking pace and consistent observer effort during peak butterfly activity periods (morning and late afternoon). Butterfly-plant interactions were recorded only when active nectar feeding was observed for a minimum duration to avoid incidental landings. Visit frequency per plant species was used as a measure of interaction occurrence. The specimens were captured using a 24-105 mm lens on a Canon EOS 5D Mark IV DSLR camera. Plant identification was carried out through expert determination, consultation of relevant taxonomic literature (Prain, 1903; Siddiqui *et al*., 2007; Huq, 2019) and examination of type images available on the websites of various international organizations, including Pl@ntNet (2009) (https://identify.plantnet.org/k-world-flora/identify), Plants of the World Online (2025) (https://powo.science.kew.org/) and Flowers of India (2016) (http://www.flowersofindia.net). To ensure data reliability and validation, plant identifications were cross-checked using both morphological characters and digital image matching tools. Only those species confirmed by at least two independent identification sources were included in the final dataset.

DNA extraction, amplification and sequencing

Using Wizard Genomic@ DNA Purification Kit (Promega, Madison, WI, USA), the genomic DNA of wild nectar providing plants of butterflies were extracted from the specific plant leaves (Table 2). Using the CTAB (cetyl trimethylammonium bromide) extraction protocol, DNA was extracted from a small amount of leaf tissue sample by incubating it at 65˚C for two hours, facilitating cell membrane disruption and removal of polysaccharides and secondary metabolites. The crude extract was subsequently purified through standard chloroform:isoamyl alcohol separation and DNA precipitation steps as per protocol guidelines. The chloroplast maturase K (matK) gene region was selected as a barcode marker for plant identification. PCR amplification was carried out using primers matK F: 5'-CGTACAGTACTTTTGTGTTTACGAG-3' and matK R: 5'-ACCCAGTCCATCTGGAAATCTTGGTTC-3'. PCR reactions were performed in a Veriti, Thermal Cycler (Applied Biosystems, USA) in a total reaction volume of 20 µl containing template DNA, PCR buffer, $MgCl_2$, dNTPs, forward and reverse primers and Taq DNA polymerase. The PCR protocol involved an initial denaturation at 95°C for 4 minutes, followed by 35 cycles of 30 seconds each: denaturation at 95°C, annealing at 49-53°C and extension at 72°C. The process ended with a 5 minutes extension at 72°C. Under ultraviolet light, PCR product was assessed using 1% agarose gel electrophoresis (Bio Analyzer). Utilizing an ABI 3500 sequencer, the amplification product was sequenced.

Statistical analysis

Data analysis and graph preparation on plant families, species and their associations with butterflies were carried out using Microsoft Excel 2021. Specimen photographs were processed and edited with Photoshop 21. The study area map was created using satellite imagery and QGIS software version 3.28, with final adjustments made in Photoshop 21.

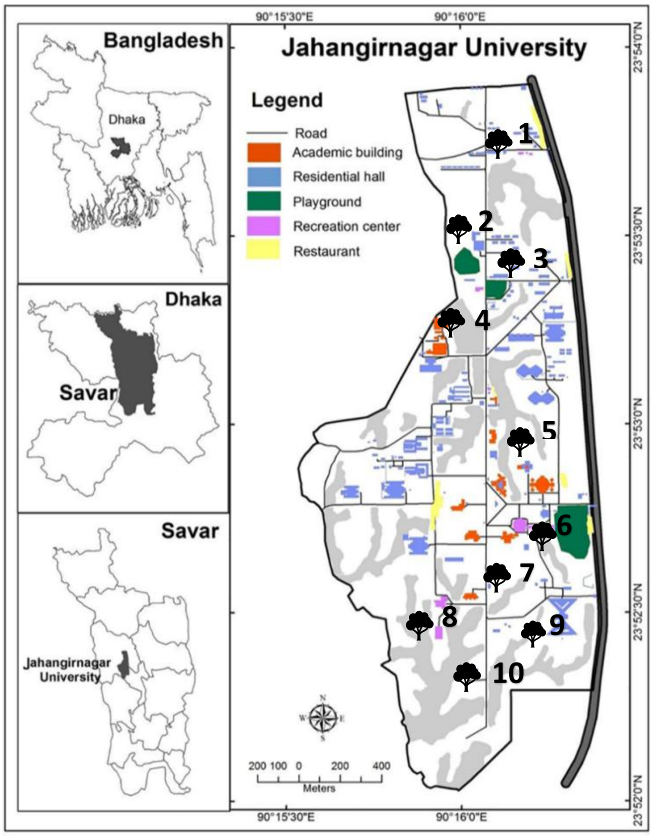

Figure 1. The ten study sites (S1-S10) at Jahangirnagar University (JU) campus, Bangladesh.

Results and Discussion

A total of 60 butterfly species were recorded on the JU campus, all dependent on 54 species of wild nectar plants (Table 1). These 54 plant species belong to 30 different families. The most represented family was Asteraceae, with 11 species, followed by Acanthaceae and Verbenaceae, each with 4 species. The following families each contained 2 species: Rubiaceae, Fabaceae, Cleomaceae, Lamiaceae, Malvaceae, Oxalidaceae, Solanaceae and Tiliaceae. Additionally, the following families each contributed 1 species: Mimosaceae, Melastomataceae, Amaryllidaceae, Rhamnaceae, Linderniaceae, Amaranthaceae, Onagraceae, Mazaceae, Convolvulaceae, Cyperaceae, Passifloraceae, Boraginaceae, Costaceae, Sapindaceae, Myrtaceae, Zingiberaceae, Arecaceae, Plantaginaceae and Apocynaceae (Table 1). Among the wild nectar plants species, including *Lantana camara*, *Richardia scabra*, *Acmella paniculata*, *Synedrella nodiflora*, *Mimosa pudica*, *Cyanthillium cinereum*, *Melastoma malabathricum*, *Wedelia trilobata*, *Lindernia crustacea*, *Sida subcordata*, *Youngia japonica*, *Alternanthera ficoidea*, *Evolvulus nummularius*, *Ageratum conyzoides*, *Mazus pumilus* and *Cyperus mindorensis* were present year-round and supported all butterflies recorded in the present study (Table 1, Figure 2). Butterflies are opportunistic foragers, visiting a diverse range of flowering plants and playing a vital role in pollination across ecosystems (Santhosh and Basavarajappa, 2016). The dependence of butterfly species on local flora has been well-documented across various habitats in home and abroad (Tiple *et al*., 2006; Kumar *et al*., 2007; Kitahara *et al*., 2008; Nimbalkar *et al*., 2011; Santhosh and Basavarajappa, 2016; Subedi *et al*., 2021; Shirisha *et al*., 2024).

Our present findings align with studies from other regions, where plant species from the Asteraceae family, along with Acanthaceae and Verbenaceae, are predominantly utilized by butterflies (Nimbalkar *et al*., 2011; Shirisha *et al*., 2024). Notably, *L. camara*, a species from the Verbenaceae family, attracts a wide variety of butterfly species (Santhosh and Basavarajappa, 2016; Pillai and Kumar, 2021; Shirisha *et al*., 2024).

The 60 butterfly species recorded in this study belong to nine families that include Nymphalidae (11 species), Pieridae (8 species), Lycaenidae (15 species), Papilionidae (6 species), Hesperiidae (11 species), Satyridae (2 species), Danaidae (5 species), Acraeidae (1 species) and Amathusiidae (1 species) (Table 1). These 9 families of butterflies were found to utilize 54 plant species across the JU campus (Table 1). Each habitat offers a distinct set of micro-environments that support butterfly populations, as demonstrated by our current findings (Shirisha *et al*., 2024). These include specific nectar plants that attract families such as Nymphalidae, Pieridae and Lycaenidae, which are commonly found in various habitats, including agricultural fields (Shirisha *et al*., 2024). Similarly, the JU campus, with its diverse flora and variety of nectar plants, plays a vital role as a habitat for butterflies, further solidifying its importance as a sanctuary for these pollinators.

Globally, the importance of nectar plants in sustaining butterfly populations is well-established, and the findings from JU align with this trend (Santhosh and Basavarajappa, 2016; Subedi *et al*., 2021).

However, urbanization and habitat destruction have led to a decline in butterfly populations, as shown by the reduction in species from 110 to 72 at the JU campus due to rapid development (IUCN-Bangladesh, 2015; Hossain, 2023; Tonmoy *et al*., 2024). These results highlight the urgent need for conservation efforts to protect butterfly habitats and ensure the continued presence of these essential species in urban ecosystems.

In the current study, floral characteristics such as corolla shape (tubular and non-tubular) and color were examined. Among the recorded plant species, those with tubular corollas (44 species) were more prevalent than those with non-tubular corollas (10 species) (Table 1). This finding is consistent with existing literature, which indicates that butterfly visits are more frequent to flowers with tubular corollas compared to those with non-tubular ones (Tiple *et al*., 2006; Subedi *et al*., 2021). In addition, Pillai and Kumar (2021) reported that butterfly proboscis length is functionally matched with corolla tube depth, enabling efficient nectar feeding and promoting mutualistic plant-pollinator relationships. This morphological correspondence explains the higher visitation rates to tubular flowers observed in the present study and supports the concept of co-evolutionary adaptation between butterflies and nectar plants. In contrast, Raju *et al*., (2004) reported that butterflies feed on both tubular and non-tubular flowers, but they tend to favor tubular flowers. Sultana *et al*., (2017) further explained that this preference is not surprising, as there is a natural morphological fit between butterfly proboscises and tubular corolla tubes. Consistent with this, our study also found a higher occurrence of tubular flowers (44 species) (Table 1). Moreover, Subedi *et al*., (2021) reported a strong correlation in between the proboscis length of butterflies and the corolla tube length of the flowers they visited. This suggests that butterflies with shorter proboscises are more likely to prefer flowers with shorter corolla tubes and vice versa (Subedi *et al*., 2021).

Moreover, the current investigation revealed that 54 plant species exhibited a variety of flower colors, including white (23 species), yellow (15 species), purple (7 species), pink (4 species) and cream (1 species) (Table 1). Among 54 plant species, four species displayed mixed flower colors as *Clerodendrum viscosum* (W+Pk), *L. camara* (Y+Pk), *Cleome rutidosperma* (P+Pk) and *Clinopodium umbrosum* (P+Pk) (Table 1). The present study revealed that flowers exhibiting white, yellow, purple and pink colors predominated, a trend corroborated by previous research indicating that butterflies exhibit a marked preference for these floral hues (Santhosh and Basavarajappa, 2016; Shirisha *et al*., 2024). However, a study that deviates from this pattern found that butterflies showed a preference for red, yellow, blue and purple flowers (Tiple *et al*., 2006). Nevertheless, yellow and purple are commonly favored in many studies (Muñoz-Galicia *et al*., 2021; Subedi *et al*., 2021). The varied results across studies can be attributed to the substantial differences in floral rewards, both within individual plant species and across different species (Yan *et al*., 2016; Subedi *et al*., 2021).

In the present study, the spatial distribution of wild nectar plants was studied across 10 sites on the JU campus (Figure 1). The results revealed that the highest plant diversity (49 species) was recorded near the Adjoining Swimming Pool (S8), while the lowest diversity (28 species) was found near the Adjoining Statistics Department (S5) (Table 1). The plant diversity at the remaining sites was as follows: Old Arts Building (S4) 29 species, Bishmile (S1) 30 species, JU School and College (S2) 30 species, Butterfly Park and Research Center (S7) 34 species, VC Lake (S3) 36 species, Adjoining Mir Mosharraf Hossain Hall (S9) 38 species, Adjoining Chemistry Department (S6) 41 species, and JU Botanical Garden (S10) 42 species (Table 1). The highest plant diversity near the Adjoining Swimming Pool (S8) is likely due to the proximity of water bodies, which enhance soil moisture and support plant growth (Zeng *et al*., 2020). In contrast, the lower diversity near the Adjoining Statistics Department (S5) may result from increased human activity and habitat disturbance from nearby construction, which can hinder plant growth.

This study aimed to develop DNA barcodes for 54 selected plant species using the matK gene. In this phase, DNA barcoding with the matK chloroplast gene has been successfully completed for 6 species, each from a different family, with the remaining 48 species set to be processed in the next phase (Table 2). The generated 6 gene sequences were submitted to NCBI GenBank and subsequent BLAST analysis revealed a high degree of similarity, ranging from 99.75% to 100%, with corresponding species globally (Table 2). These results highlight the accuracy and reliability of DNA barcoding for plant species identification, particularly when traditional morphological methods are difficult or unreliable (Hebert *et al*., 2003; Kress *et al*., 2005). The successful barcoding of these 6 nectar plant species not only validates the methodology but also serves as a pilot study for establishing a national molecular repository in Bangladesh. This work will contribute to the broader application of DNA barcoding for all 54 species, enhancing our ability to identify plants in ecological and conservation contexts (Hollingsworth *et al*., 2009).

Finally, this study emphasizes the importance of the JU campus in supporting butterfly populations through a diverse range of nectar resources. It offers valuable insights into butterfly conservation and habitat management, which are crucial for preserving biodiversity and promoting sustainable ecosystems within this semi-natural campus habitat.

Table 1. Checklist of butterfly and their associated wild nectar plants on the campus of Jahangirnagar University.

Butterfly Species	Butterfly Family	Plant Species and Family	Corolla Shape	Flower Color	Plant sp. Present in Different Study Sites									
		Acanthaceae			**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**
Eurema hecabe	Pieridae	*Asystasia gangetica*	T	W				√	√		√	√	√	√
Zizula hylax	Lycaenidae													
Iambrix salsala	Hesperiidae													
Eurema hecabe, Catopsilia pomona	Pieridae	*Rungia pectinata*	T	P			√			√	√	√		√
Hypolimnas bolina	Nymphalidae													
Pelopidas mathias	Hesperiidae													
Zizula hylax, Chilades sp., *Zizina otis*	Lycaenidae	*Phaulopsis dorsiflora*	T	W					√	√	√	√		√
Pelopidas mathias	Hesperiidae													
Danaus genutia, Euploea core	Danaidae	*Justicia adhatoda*	T	W										√
Pelopidas mathias	Hesperiidae													
		Asteraceae												
Papilio polytes	Papilionidae	*Wedelia trilobata*	NT	Y	√	√	√	√		√	√	√	√	√
Eurema hecabe	Pieridae													
Zizeeria karsandra	Lycaenidae													
Phalanta phalantha	Nymphalidae													
Acraea terpsicore	Acraeidae													
Danaus chrysippus	Danaidae	*Synedrella nodiflora*	T	Y	√	√	√		√		√	√		√
Eurema hecabe, Catopsilia pomona, Catopsilia pyranthe	Pieridae													
Zizina otis	Lycaenidae													
Pelopidas mathias	Hesperiidae													
Eurema hecabe, Leptosia nina	Pieridae	*Cyanthillium cinereum*	T	P	√	√	√	√	√		√	√		√
Leptosia nina, Catopsilia pomona	Pieridae	*Acmella paniculata*	T	Y		√	√		√	√	√	√	√	√
Rapala manea, Anthene lycaenina	Lycaenidae	*Mikania micrantha*	T	W	√			√	√	√	√	√		
Pachliopta aristolochiae	Papilionidae													
Catopsilia sp.	Pieridae	*Youngia japonica*	T	Y	√		√			√	√	√		√
Danaus chrysippus	Danaidae													
Tarucus nara	Lycaenidae													
Moduza procris	Nymphalidae													
Euploea core, Danaus chrysippus	Danaidae	*Vernonia elaeagnifolia*	T	W						√		√		√
Papilio demoleus	Papilionidae													
Eurema brigitta, Delias eucharis	Pieridae													
Danaus chrysippus	Danaidae	*Ageratum conyzoides*	T	W	√	√	√	√	√	√	√	√	√	√
Papilio demoleus	Papilionidae													
Zizina otis	Lycaenidae													

Borbo cinnara	Hesperiidae													
Danaus chrysippus	Danaidae	*Pseudelephantopus spicatus*	T	W		√	√			√		√	√	√
Papilio demoleus	Papilionidae													
Eurema hecabe	Pieridae													
Danaus chrysippus	Danaidae	*Eclipta prostrata*	T	W			√	√	√		√	√		
Leptosia nina	Pieridae													
Eurema hecabe	Pieridae	*Chromolaena odorata*	T	W			√	√		√	√	√	√	√
Iambrix salsala, Pelopidas mathias	Hesperiidae													
		Verbenaceae												
Danaus chrysippus, Danaus genutia	Danaidae	*Clerodendrum viscosum*	T	W+Pk	√	√	√	√	√	√	√	√	√	√
Papilio polytes, Graphium agamemnon, Papilio demoleus	Papilionidae													
Belenois aurota, Catopsilia pyranthe, Cepora nerissa, Eurema hecabe	Pieridae													
Spindasis lohita	Lycaenidae													
Borbo cinnara	Hesperiidae													
Eurema hecabe	Pieridae	*Lippia alba*	T	W	√	√						√		√
Pelopidas mathias, Udaspes folus	Hesperiidae													
Junonia almana	Nymphalidae	*Phyla nodiflora*	T	W	√	√			√	√		√		
Chilades pandava, Zizina otis	Lycaenidae													
Danaus chrysippus	Danaidae													
Danaus chrysippus, Danaus genutia, Euploea core, Tirumala limniace, Tirumala septentrionis	Danaidae	*Lantana camara*	T	Y+Pk	√	√	√	√	√	√	√	√	√	√
Graphium doson, Papilio clytia, Papilio demoleus	Papilionidae													
Belenois aurota, Catopsilia pomona	Pieridae													
Hypolimnas bolina, Hypolimnas misippus, Junonia atlites, Junonia lemonias, Phalanta phalantha	Nymphalidae													
Caleta decidia, Rapala manea	Lycaenidae													
Pelopidas conjuncta, Tagiades japetus, Sarangesa dasahara, Iambrix salsala, Pelopidas mathias, Borbo cinnara, Hasora chromus	Hesperiidae													

		Mimosaceae												
Belenois aurota	Pieridae	*Mimosa pudica*	T	Pk	√	√	√	√	√	√	√	√	√	√
Junonia iphita	Nymphalidae													
Castalius rosimon, Zizula hylax	Lycaenidae													
		Melastomataceae												
Junonia atlites, Junonia lemonias, Athyma perius	Nymphalidae	*Melastoma malabathricum*	NT	Pk	√	√	√	√	√	√	√	√	√	√
		Amaryllidaceae												
Papilio sp.	Papilionidae	*Crinum asiaticum*	T	W										
Iambrix salsala, Pelopidas agna	Hesperiidae													
		Rubiaceae												
Eurema hecabe	Pieridae	*Richardia scabra*	T	W	√	√	√	√	√	√	√	√	√	√
Acraea terpsicore	Acraeidae													
Castalius rosimon, Chilades lajus	Lycaenidae													
Tarucus callinara, Zizina otis, Chilades pandava	Lycaenidae	*Hedyotis corymbosa*	T	P						√		√	√	
Pelopidas mathias, Borbo cinnara	Hesperiidae													
		Rhamnaceae												
Papilio polytes	Papilionidae	*Ziziphus mauritiana*	T	Y	√				√			√	√	√
Catopsilia pomona	Pieridae													
Udaspes folus, Tagiades japetus	Hesperiidae													
		Fabaceae												
Euthalia aconthea, Neptis hylas, Athyma perius, Junonia almana	Nymphalidae	*Senna tora*	NT	Y	√	√	√	√	√	√	√	√	√	√
Cepora nerissa	Pieridae	*Desmodium heterocarpon*	NT	P						√		√	√	√
Castalius rosimon	Lycaenidae													
		Linderniaceae												
Eurema hecabe	Pieridae	*Lindernia crustacea*	T	P	√	√	√	√	√	√	√	√	√	√
Zizina otis	Lycaenidae													
		Cleomaceae												
Belenois aurota	Pieridae	*Cleome rutidosperma*	T	P+Pk			√			√		√	√	
Acraea terpsicore	Acraeidae													
Castalius rosimon, Tarucus callinara	Lycaenidae													
Pelopidas mathias	Hesperiidae													
Leptosia nina	Pieridae	*Corynandra viscosa*	NT	Y	√	√	√	√		√	√	√	√	√
Castalius rosimon, Zizina otis	Lycaenidae													
Pelopidas mathias	Hesperiidae													

		Amaranthaceae												
Danaus chrysippus	Danaidae	*Alternanthera ficoidea*	T	W	√	√	√	√	√	√	√	√	√	√
Zizula hylax	Lycaenidae													
Ypthima huebneri	Satyridae													
		Lamiaceae												
Danaus chrysippus	Danaidae	*Mesosphaerum suaveolens*	T	P		√	√					√	√	√
Papilio demoleus	Papilionidae													
Eurema brigitta	Pieridae													
Danaus chrysippus	Danaidae	*Clinopodium umbrosum*	T	P+Pk			√	√		√		√	√	√
Zizula hylax	Lycaenidae													
		Malvaceae												
Danaus chrysippus	Danaidae	*Urena lobata*	T	Pk	√	√	√	√	√	√	√	√	√	√
Papilio sp.	Papilionidae													
Tagiades japetus	Hesperiidae													
Euploea core	Danaidae	*Sida subcordata*	NT	Y	√	√			√	√		√		
Junonia almana	Nymphalidae													
		Onagraceae												
Eurema hecabe, Catopsilia pomona, Eurema brigitta	Pieridae	*Ludwigia hyssopifolia*	T	Y				√		√	√	√	√	√
		Oxalidaceae												
Danaus chrysippus	Danaidae	*Oxalis debilis*	NT	Pk	√	√	√	√		√	√	√	√	√
Eurema hecabe	Pieridae													
Borbo cinnara, Tagiades japetus	Hesperiidae													
Belenois aurota	Pieridae	*Oxalis corniculata*	NT	Y							√		√	√
Castalius rosimon, Zizula hylax, Zizina otis	Lycaenidae													
		Mazaceae												
Eurema hecabe	Pieridae	*Mazus pumilus*	T	W	√	√	√	√		√	√	√	√	√
Parnara guttatus, Badamia exclamationis	Hesperiidae													
		Convolvulaceae												
Danaus chrysippus	Danaidae	*Evolvulus nummularius*	NT	W	√	√	√	√	√	√	√	√	√	√
Eurema hecabe	Pieridae													
		Cyperaceae												
Pseudozizeeria maha, Chilades lajus	Lycaenidae	*Cyperus mindorensis*	T	W	√	√	√	√	√	√	√	√	√	√
		Solanaceae												
Eurema hecabe, Leptosia nina	Pieridae	*Solanum violaceum*	T	P	√	√				√		√	√	
Iambrix salsala	Hesperiidae													
Sarangesa dasahara, Hasora chromus	Hesperiidae	*Physalis angulata*	T	Y	√	√	√	√	√	√	√	√	√	√
		Passifloraceae												

Junonia almana	Nymphalidae	*Passiflora foetida*	T	W			√	√		√	√	√		√
Acraea terpsicore	Acraeidae													
		Boraginaceae												
Euploea core, Danaus chrysippus, Tirumala limniace	Danaidae	*Heliotropium indicum*	T	W	√	√	√	√	√	√	√	√	√	√
		Costaceae												
Iambrix salsala, Tagiades japetus, Borbo cinnara	Hesperiidae	*Cheilocostus speciosus*	T	W	√	√	√	√	√	√	√	√	√	√
		Sapindaceae												
Euploea core, Danaus chrysippus	Danaidae	*Cardiospermum halicacabum*	T	W	√	√			√	√		√	√	
Eurema hecabe	Pieridae													
		Myrtaceae												
Neptis hylas	Nymphalidae	*Syzygium cumini*	T	W			√	√		√	√	√	√	√
Euchrysops cnejus	Lycaenidae													
		Tiliaceae												
Neptis hylas	Nymphalidae	*Microcos paniculata*	T	Y			√		√	√			√	√
Talicada nyseus	Lycaenidae													
Zizula hylax, Chilades lajus	Lycaenidae	*Triumfetta rhomboidea*	NT	Y						√		√	√	√
		Zingiberaceae												
Papilio sp.	Papilionidae	*Zingiber zerumbet*	T	Cr			√							
Eurema hecabe	Pieridae													
Junonia almana	Nymphalidae													
		Arecaceae												
Mycalesis mineus, Ypthima huebneri	Satyridae	*Calamus rotang*	T	Y			√					√	√	
Discophora sondaica	Amathusiidae													
		Plantaginaceae												
Catopsilia pomona, Eurema hecabe	Pieridae	*Mecardonia procumbens*	T	Y			√	√			√	√		
Zizina otis	Lycaenidae													
Pelopidas mathias	Hesperiidae													
		Apocynaceae												
Eurema hecabe	Pieridae	*Rauvolfia serpentina*	T	W	√	√			√	√		√	√	√
Zizina otis	Lycaenidae													
Pelopidas agna	Hesperiidae													

Notes: White (W), Purple (P), Yellow (Y), Pink (Pk), Cream (Cr); Tubular (T), Non-tubular (NT)

Table 2. List of six wild nectar plants with matK gene sequence accession details from GenBank

SL No.	Scientific Name	Common Name	Family	Voucher No.	GenBank Similarity (%)	Accession Number
1	*Senna tora*	Chakunda	Fabaceae	PLBV0015	99.88%	PV530377

2	*Corynandra viscosa*	Holud Hurhure	Cleomaceae	PLBV0022	100%	PV530379
3	*Heliotropium indicum*	Hatishur	Boraginaceae	PLBV0021	100%	PV476743
4	*Asystasia gangetica*	Gangatara	Acanthaceae	PLBV0023	99.64%	PV553637
5	*Lantana camara*	Kutush Kanta	Verbenaceae	PLBV0024	99.88%	PV553638
6	*Richardia scabra*	Mexican Clover	Rubiaceae	PLBV0025	99.75%	PV553639

Figure 2. Documentation of 16 wild nectar plants which are extensively utilized by butterflies on the JU campus: (A) *L. camara*, (B) *R. scabra,* (C) *A. paniculata,* (D) *S. nodiflora,* (E) *M. pudica,* (F) *C. cinereum,* (G) *M. malabathricum,* (H) *W. trilobata*, (I) *L. crustacea,* (J) *S. subcordata,* (K) *Y. japonica*, (L) *A. ficoidea,* (M) *E. nummularius,* (N) *A. conyzoides,* (O) *M. pumilus* and (P) *C. mindorensis.*

Conclusions

This study emphasizes the crucial role of wild nectar-bearing plants in supporting butterfly populations on the Jahangirnagar University campus, fostering biodiversity and ecosystem stability. The research identified 54 plant species from 30 families that contribute to the habitat of 60 butterfly species. DNA barcoding, using the matK gene, confirmed high accuracy in plant species identification, laying the groundwork for broader molecular applications in biodiversity monitoring. The findings emphasize the importance of molecular techniques in enhancing our understanding of plant-pollinator relationships, facilitating more precise ecological assessments.

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Conflicts of Interest

None to declare.

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