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Floristic composition and species diversity of Tra Vinh University campus, Vietnam

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Abstract. *Nhu NK, Ai TN, Dang TTT, Lam TX, Giau QN, Duong TTT, Nhu TTK. 2026. Floristic composition and species diversity of Tra Vinh University campus, Vietnam. Biodiversitas 27 (2): d270230. https://doi.org/10.13057/biodiv/d270230*. The floristic composition and species diversity of the Tra Vinh University (TVU) campus, an understudied Urban Green Space (UGS) in Vietnam's Mekong Delta, were comprehensively documented through field surveys conducted during 2023-2024. Six transects covering the campus were established, and all vascular plant species occurring within 50 m on both sides of each transect were recorded, photographed, and identified using standard taxonomic references and global databases. A total of 251 species, belonging to 195 genera, 74 families, 36 orders, and 2 phyla, were documented. Of these, 143 species (57%) were identified as native to Vietnam, including 3 endemic species. The flora was dominated by Fabaceae, Poaceae, and Asteraceae, which together accounted for more than 20% of total species richness. Herbaceous plants constituted the largest life-form group (41.4%), followed by trees (22.3%) and shrubs (20.7%). Of the whole recorded species in the flora, 248 possessed documented use-values, mainly medicinal (56.6%), ornamental (18.7%), and food (16.7%) plants. Seven species were listed as threatened under the IUCN Red List or the Vietnam Red Data Book, including *Pterocarpus macrocarpus* and *Drynaria bonii*. Despite being a managed urban area, the campus supports floristic diversity comparable to that of other tropical regions in southern Vietnam. The presence of rare and threatened species underscores the role of university campuses as important refugia for urban biodiversity. These findings highlight TVU's potential for development into a botanical garden dedicated to the long-term ex situ conservation of native and rare plant species and the restoration of urban habitats.

Keywords: Conservation status, life-form, medicinal plant, plant diversity, urban green space

INTRODUCTION

Plant diversity, an essential component of overall biodiversity, exists at multiple levels, including genetic variation within species, species richness within communities, and variation among ecosystems (Zhou 2023). Plants play an irreplaceable role in maintaining the structure and function of ecosystems (Sagar et al. 2012). They provide numerous benefits to humans and the environment, serving as sources of food, medicine, timber, and fiber; regulating climate; and offering habitats for countless microorganisms, fungi, animals, and other plants (Corlett 2016; Hop et al. 2024). Floristic diversity is therefore a vital foundation for ecological resilience, global food security, and the sustainable development of human society (Ma et al. 2021; Zhou 2023).

However, plant communities are highly sensitive to environmental changes such as soil degradation, topographic alteration, and climate variability, as well as to anthropogenic pressures including land-use change and pollution (Zhang et al. 2021; Huang and Fu 2023). Documenting the flora of specific regions is thus essential for understanding ecological responses and guiding conservation and management efforts (Thakur and Puri 2016). While such studies are typically conducted in natural forests or protected areas, floristic assessments are increasingly important in human-managed environments such as Urban Green Spaces (UGSs), including public parks, botanical gardens, and university campuses, which contribute meaningfully to ecological stability within cities.

Urbanization has become one of the most serious global drivers of biodiversity loss. Rapid city expansion leads to the destruction of natural landscapes, disruption of ecological connectivity, habitat fragmentation, and reductions in green space (Sarkodie et al. 2020). Paradoxically, however, well-planned and well-managed UGSs can mitigate these impacts. University campuses, in particular, often contain patches of semi-natural vegetation and deliberately planted green areas that can support substantial biodiversity and act as refuges for numerous plant and animal species (Ives et al. 2016; Aronson et al. 2017). In addition, they provide valuable opportunities for environmental education and biodiversity research (Norton et al. 2019; Paudel and States 2023).

Tra Vinh University (TVU), located in Tra Vinh City, southern Vietnam, covers approximately 50 ha and follows a development strategy centered on creating a green, eco-friendly campus. Tra Vinh City possesses one of the highest proportions of green-covered land in Vietnam (VNA 2021), and TVU has implemented numerous green projects aimed at enhancing campus vegetation and sustainability (Khanh 2018). As a result, TVU maintains both remnants of the former campus flora and a wide variety of introduced ornamental and shade-providing species. The university has been consistently ranked among the world's top 200 green

and sustainable universities (133rd in 2024) (UI GreenMetric 2024). Despite this strong environmental orientation, the plant species composition and floristic diversity of the TVU campus have never been systematically assessed. The current status of TVU's flora therefore remains unknown.

Globally, numerous floristic studies have been carried out in both natural and urban ecosystems (Rajendran et al. 2014; Aziz et al. 2015; Parthipan et al. 2016; Soni et al. 2020). Beyond their primary educational function, university campuses play important role in the preservation of native plant species and urban flora. Previous surveys have demonstrated that the flora in these areas exhibits a relatively high species diversity, conservation value, and ecological significance, despite being embedded within highly managed landscapes (Soni et al. 2020; Khan et al. 2021; Danya and Yaazhini 2022; Mudasiru et al. 2024; Al Shaye et al. 2025; Silué et al. 2025). In Vietnam, however, most floristic research has focused on forested or protected areas (Hoang et al. 2018; Mai 2018; Son et al. 2018; Lê et al. 2019; Hop et al. 2024; Yen et al. 2024). Studies of UGSs, especially university campuses, remain limited. The Mekong Delta, a region undergoing rapid environmental change and urban development, has very few published assessments of campus flora. Consequently, the floristic diversity of universities in this region, including TVU, remains poorly understood.

In this context, surveying and evaluating the current floristic diversity of university campuses, including Tra Vinh University, is highly necessary. The present study aims to assess the floristic diversity of the TVU campus by examining species composition taxonomic structure, plant growth forms, use-values, and conservation status. The findings provide essential baseline information for future cultivation, management, and conservation planning, thereby contributing to the sustainable development of TVU's green space and supporting biodiversity conservation in the Mekong Delta.

MATERIALS AND METHODS

Study area and period

This study was carried out at the campus of Tra Vinh University, Vĩnh Long Province, Mekong Delta region, southern Vietnam (9°55′24.6″N, 106°20′49.7″E). The campus of Tra Vinh University, with an area of approximately 50 ha, is located in Tra Vinh City and falls within the tropical monsoon climate of the Mekong Delta region, with two distinct seasons (dry and rainy) (Lee and Dang 2020). Seasonal field surveys were conducted from 2023 to 2024 in various areas of the TVU campus (Figure 1).

Data collection

Field survey

The TVU flora was investigated using the transect strategy introduced by Thin (2007). Based on the TVU map obtained from Google Earth, 6 survey transects (A-F) were established. The survey team moved slowly and carefully along each transect, observing an area extending at least 50 m on both sides of the line to record, document, and describe the plant species composition using standardized investigation sheets. Three to five standard plots of 100 m² were randomly placed on each transect based on transect length (300-600 m) and habitat heterogeneity to record the presence of woody plants, shrubs, and palm-like forms. Consequently, transect D contained three plots, whereas the other contained five plots. Within each standard plot, three 10 m² subplots were surveyed for herbs, climbers and creepers. In total, 28 standard plots and 84 subplots were established across the 6 transects. Sampling sufficiency was qualitatively assessed during fieldwork by monitoring the decline in newly observed species with each additional plot along the transects. Field investigations were conducted twice per year (once during the rainy season and once during the dry season), with each survey lasting one month.

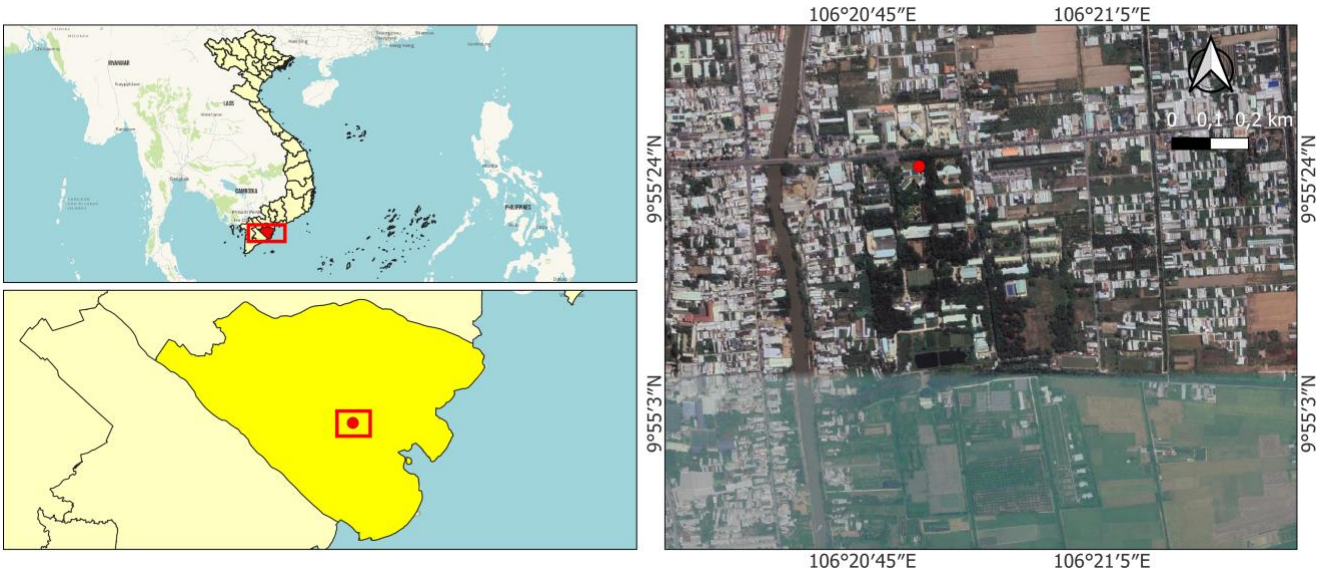

Figure 1. Map showing the study area at Tra Vinh University, Tra Vinh City, Tra Vinh Province, Mekong Delta, Vietnam

Plant sample collection

Plant specimens within the survey areas were collected using the sampling method described by Thin (2007). During collection, plants were recorded and photographed before sampling. Three to five specimens per species were collected, including representative parts (stems, leaves, flowers, fruits, seeds, etc.) to support accurate classification. The sampled plant specimens were preliminarily processed, placed in plastic bags, and labelled with unique code numbers. Each specimen was provisionally identified using common and scientific names for subsequent laboratory verification (Thin 2007).

Plant species identification

A list of plant species present on TVU campus was established following standard floristic procedures. Collected plant specimens were preliminarily processed and classified for identification of species, scientific name and plant taxa based on comparison of key morphological characteristics (leaf, stem, root, flower, fruit, seed) using reference specimens from the botanical collections of the Southern Institute of Ecology, universities, and national parks such as Cat Tien, Con Dao, and Phu Quoc or specialized literature sources (for specimens lacking suitable reference samples) from Lecomte (1907), Ho (1999-2003) Wu and Larsen (2000), Cuc et al. (2001), Ban (2003-2005), VAST (1996-2008) and verified using major global online databases (GBIF 2025; IPNI 2025; POWO 2025; WFO 2025). For general taxonomic hierarchy, Brummitt (1992); Takhtajan (2009) were consulted; however, the final arrangement and classification of orders, families, and species strictly follow the modern APG IV system (Chase et al. 2016), which is globally accepted and widely used in contemporary floristic studies. Within each rank, taxa (classes, orders, families, genera, and species) were organized alphabetically. The level of floral diversity at TVU was analyzed following the Manual for Biodiversity Research by Thin (1997).

Life-form and use-value identification

The plant life-form was determined using the classification systems for tropical plant species described by Box (1981), Cuc et al. (2001), Ban (2003-2005), Rowe and Speck (2005), Thin (2007), and Chi (2018). Each species was assigned to one of the adaptive growth-form categories: trees, shrubs, herbs, climbers, creepers, hydrophytes, or palms. The use-value of recorded species on the TVU campus was categorized based on specialized reference materials sources (Chi and Hop 1999-2002; Ho 1999-2003; Bich et al. 2006; Loi 2015; Chi 2018), and online database (UTP 2025).

Conservation status and original identification

The conservation status of collected plant species at TVU campus was evaluated based on IUCN Red List (IUCN 2025), Vietnam Red Data Book (Ban et al. 2007), and Decree No. 84/2021/ND-CP of the Government of Vietnam (2021). While the origin of each plant species (native, exotic or invasive) was identified according to Ban (2003-2005), global online database (POWO 2025) and Circular 35/2018/TT-BTNMT of MONRE on criteria for determining invasive alien species.

Data analysis

Descriptive statistics on species richness, taxonomic composition, and life-form categories were compiled in Microsoft Excel (version 2016). Species occurrence data from the standard plots and subplots were synthesized to produce the floristic checklist. All plant scientific names were standardized according to the APG IV classification system (Chase et al. 2016) and verified with the Plants of the World Online (POWO 2025) and World Flora Online (WFO 2025) databases.

RESULTS AND DISCUSSION

Floristic composition and taxonomic diversity

Plant species were surveyed and collected across the Tra Vinh University (TVU) campus. Based on analyses of collected specimens and field photographs, a total of 251 plant species were recorded. These species belong to 195 genera, 74 families, 36 orders, 4 classes, and 2 divisions, namely Polypodiophyta and Magnoliophyta (Table 1). Among the recorded flora, 143 species were identified as native to Vietnam (57% of the total). Of these, 3 species are endemic to Vietnam (*Pandanus tonkinensis*, *Magnolia balansae*, and *Alpinia tonkinensis*). At the same time, 4 endemic species from the Indochina region and 12 from Southeast Asia were also confirmed.

Table 1. The taxon diversity in the flora of Tra Vinh University campus

Phylum/Class	Order		Family		Genera		Species	
	Quantity	Percentage (%)	Quantity	Percentage (%)	Quantity	Percentage (%)	Quantity	Percentage (%)
Polypodiophyta	3	8.33	6	8.11	7	3.63	7	2.79
Polypodiopsida	3	8.33	6	8.11	7	3.63	7	2.79
Magnoliophyta	33	91.67	68	91.89	188	96.37	244	97.21
Magnoliopsida	23	63.89	51	68.92	138	70.47	183	72.91
Liliopsida	8	22.22	14	18.92	46	23.83	56	22.31
Magnoliids	2	5.56	3	4.05	4	2.07	5	1.99
Total	36	100	74	100	195	100	251	100

The taxonomic distribution between the two divisions was uneven. Magnoliophyta (Angiosperms) was dominant, comprising 244 species (97.2%), whereas Polypodiophyta accounted for 7 species (2.8%). Within Magnoliophyta, taxa were distributed among 186 genera (96.37%), 68 families (91.89%), and 22 orders (91.67%). Magnoliopsida (Eudicots) was the most abundant class with 184 species, followed by Liliopsida (Monocots), which contributed less than 25% of taxa at all taxonomic levels. Magnoliids were represented by 5 species, belonging to 4 genera, 3 families, and 2 orders (Table 1). The Magnoliopsida/Liliopsida (M/L) ratio was 3.26 at the species level, 3.00 at the genus level, and 3.64 at the family level.

Taxonomic distribution at order and family levels

Our analysis indicated that all plant species recorded in the survey were unevenly distributed across 36 orders and 74 families (Table 1). Among these, 10 orders were identified as having the most diverse species composition (ranging from 8 to 26 species). These 10 orders comprise a total of 163 species (accounting for 64.94% of the total species). The order Lamiales had the highest species diversity with 26 species (10.36%). This order also had the highest number of genera (23 out of a total of 195 genera). The following orders were Poales (24 species), Fabales (19 species), and Malpighiales (19 species). There were 9 orders with only one single species, namely Salviniales, Schizaeales, Ceratophyllales, Fagales, Proteales, Theales, Piperales, Acorales, and Pandanales (Table 2).

Figure 2 illustrates how species are distributed across the 74 plant families recorded on the TVU campus. Of these families, 34 are represented by a single species (accounting for 45.21% of all families but only 0.4% of the total species per each), while 7 families contain two species, 11 families contain three species, and 2 families contain four species. The remaining families each contain five or more species.

At the family level, ten most species-rich families comprised 106 species (42.23%) of the flora (Figure 3.A). This TVU flora was dominated by three families, including Fabaceae, Poaceae, and Asteraceae. Of these, Fabaceae is the richest (19 species; 7.57%), followed by Poaceae (16 species; 6.37%) and Asteraceae (15 species; 5.98%). These families together accounted for 75 genera (38.5%) of the total genera recorded (Figure 3.B).

Table 2. The ten most diverse orders in terms of species

Name of order	Number of species	Percentage (%)
Lamiales	26	10.36
Poales	24	9.56
Fabales	19	7.57
Malpighiales	19	7.57
Asterales	16	6.37
Myrtales	16	6.37
Caryophyllales	15	5.98
Gentianales	11	4.38
Malvales	9	3.59
Rosales	8	3.19

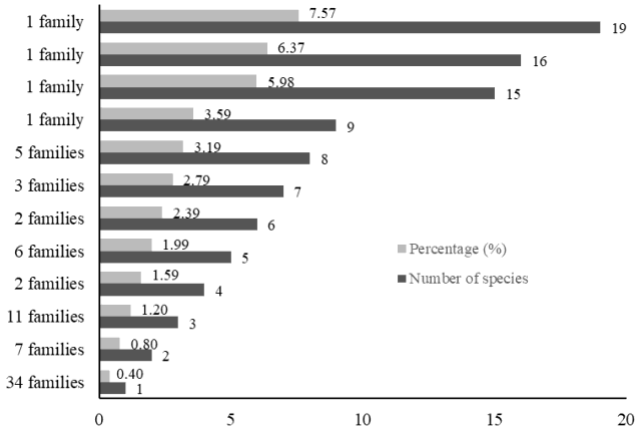

Figure 2. The statistics on the number and percentage of species by family

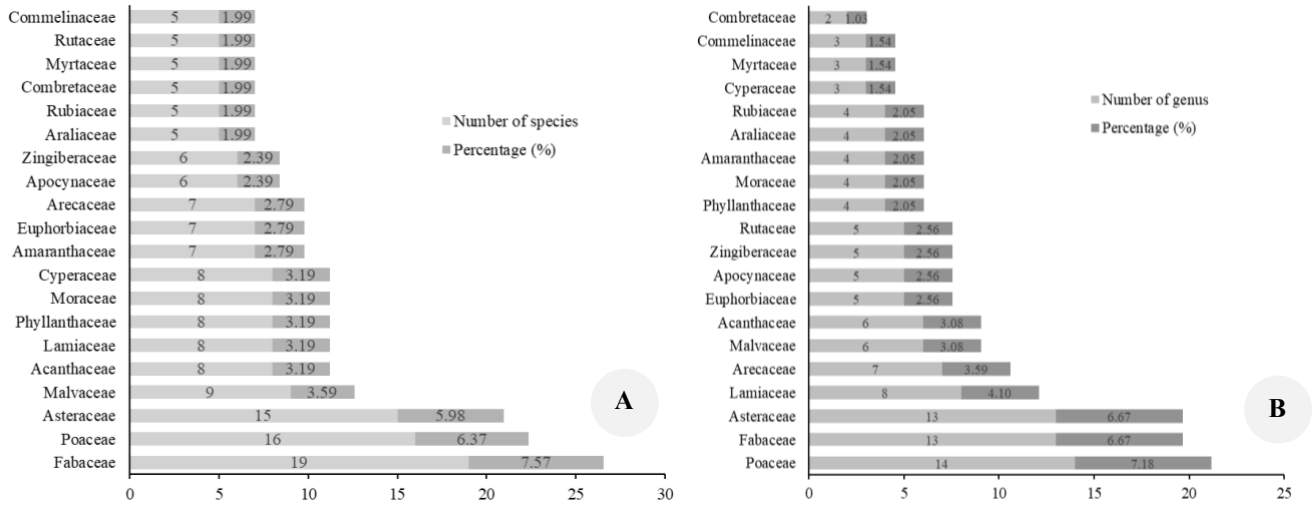

Figure 3. Statistics of the twenty most diverse families by: A. Species, B. Genus

Genus-level diversity

Our survey result on TVU flora recorded a total of 195 genera and most of them were represented by only one single species (158 out of 195 genera, accounting for over 80% of total recorded genera) (Figure 4). In addition, 26 genera were represented by 2 species each (0.8%), 7 genera had 3 species each (1.2%) and the rest 4 genera has at least 4 species. The most species-richest genus was represented by 6 species (2.39%) (Figure 4).

A detailed analysis identifies 11 genera that together contain 41 species, accounting for 16.33% of all species and 5.64% of all genera recorded on the campus (Table 3). Among these, *Cyperus* is the most diverse, with six species (2.39%), many of which are common weeds in grassland or net-house areas, including *Cyperus difformis*, *Cyperus iria*, *Cyperus pilosus*, *Cyperus polystachyos*, *Cyperus esculentus*, and *Cyperus rotundus*. *Phyllanthus* and *Ficus* followed with five species each, while *Cassia* contains four species (1.59%). The remaining genera within the richest group each contained three species (1.2%).

Life-form spectrum

The plant species in the whole flora of TVU campus were divided into seven groups of life-forms including tree, shrub, herb, climber, creeper, hydrophyte (aquatic plant) and palm (Figure 5.A). Of these, the herbaceous group was the most dominant, accounting for 41% of the total recorded species. The woody plant group (trees and shrubs) comprised 108 species, including 56 tree species and 52 shrub species, and was mainly distributed among families such as Fabaceae, Lecythidaceae, Sapotaceae, Asteraceae, Rubiaceae, Acanthaceae, and Malvaceae. Tree species were largely cultivated for landscaping, whereas shrubs occurred mainly as wild or medicinal plants. The climber group consisted of 20 species (8%), sporadically distributed across several plant families. The remaining life-form groups together accounted for less than 4% of the total flora and included aquatic plants (8 species), palms (7 species), and creepers (4 species) (Figure 5.A). Life-form distributions of the most dominant families and most diverse genera were similar to those of the overall flora, with herbaceous species remaining dominant, followed by woody plants (Figure 5.B, 5.C).

Among the recorded flora, 7 fern species (Polypodiophyta) were non-flowering. The remaining 244 flowering species (Magnoliophyta) included 40 solitary-flower species (16%) and 204 inflorescence-bearing species (81%) (Figure 6.A). These species were classified into 12 fruit types, with capsules being the most common (78 species; 31%), followed by berries (48 species) and achenes (33 species). Schizocarp and syconium fruit types were least represented (two species each) (Figure 6.B).

Use-value categories

The recorded plants in TVU flora are diverse, not only in terms of floristic components and life-forms but also in use value. Excluding three species (*Brachiaria mutica*, *Echinochloa colonum*, and *Panicum trichoides*) that were recorded as weeds or of unknown use, all remaining species were identified as locally useful (accounting for 98.8% of total species) (Table 4). These useful plants were categorized into five main use-value groups, including cover crop, ornamental, timber, food, and medicinal plants. In this flora, each species may possess either a single or multiple use values. The proportion of single-use and multi-use species was relatively similar, accounting for 52.6% and 46.2%, respectively. Among the five use-value categories, medicinal plants were predominant, comprising 142 species (57.26%), followed by ornamental plants (47 species; 18.85%) and food plants (42 species; 16.73%). The timber group included 16 species (6.45%), while the cover crop group contained only one species, representing the smallest proportion. These results demonstrate that the flora of TVU campus not only exhibits high taxonomic and life-form diversity but also holds substantial ethnobotanical and ecological value, particularly due to the large proportion of medicinal and ornamental plant species.

The distribution of species by use-value among dominant families and genera showed a pattern consistent with that of the entire TVU flora, with medicinal plants overwhelmingly dominant (Table 5). In the 20 most species-rich families, medicinal plants accounted for over 60% (98 out of 162 species), while in the 11 most diverse genera, they represented more than 51% (21 out of 41 species). All three weed species and one cover crop species identified in the TVU flora were found within the group of these richest families. In contrast, only four main use-value groups were represented (medicinal, ornamental, food, and timber) among the 11 dominant genera (Table 5).

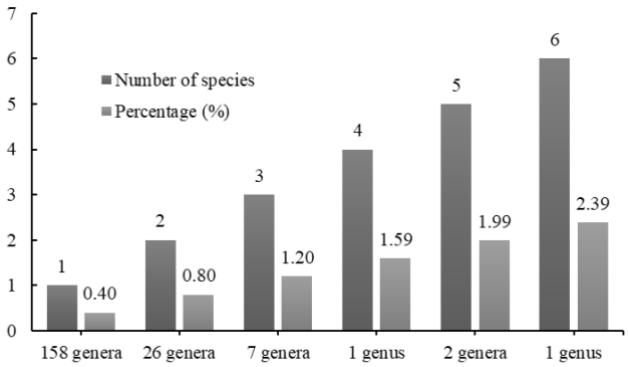

Figure 4. Statistics on the number and percentage of species by genus in TVU flora

Table 3. The most diverse genus of species in the TVU flora

Name of genus	Number of species	Percentage (%)
Cyperus L.	6	2.39
Phyllanthus L.	5	1.99
Ficus Tourn. ex L.	5	1.99
Cassia L.	4	1.59
Desmodium Desv.	3	1.20
Terminalia L.	3	1.20
Syzygium Gaertn.	3	1.20
Ludwigia L.	3	1.20
Ipomoea L.	3	1.20
Commelina Plum. ex L.	3	1.20
Bambusa Schreb.	3	1.20

Diversity of precious and rare plants in the TVU flora and the conservation status

The current and conservation status of plant species recorded in the TVU flora was assessed using the IUCN Red List of Threatened Species (IUCN 2025), the Vietnam Red Data Book: Part II - Plants (Ban et al. 2007), and Decree No. 84/2021/ND-CP of the Government of Vietnam. The results showed that all plant species in the TVU ranged from the Endangered (EN) to the very common level, and no species were classified as Critically Endangered (CR), Regionally Extinct (RE), or Extinct in the Wild (EW). Most of the recorded species belong to either the Least Concern (LC) group (168 species) or the Not Evaluated (NE) group (65 species) (Figure 7). Based on the IUCN Red List, two species were identified as Near Threatened (NT) (*Chrysalidocarpus lutescens* and *Eucalyptus obliqua*), three species were classified as Vulnerable (VU) (*Khaya senegalensis*, *Drynaria bonii*, and *Adonidia merrillii*), and two species were listed as Endangered (EN) (*Pterocarpus macrocarpus* and *Garcinia cochinchinensis* (Figure 8). However, among these seven threatened species, only two species were recorded in the Vietnam Red Data Book, including *D. bonii* (VU) and *P. macrocarpus* (EN).

Invasive species composition

In addition to local use-value and threatened species, six plant species in TVU campus are also recognized as invasive species (*Pontederia crassipes*, *Mimosa pigra*, *Lantana camara*, *Sphagneticola calendulacea*, *Eupatorium odoratum*, and *Ageratum conyzoides*). They are genuinely problematic and have potential to harm the ecosystem of TVU campus.

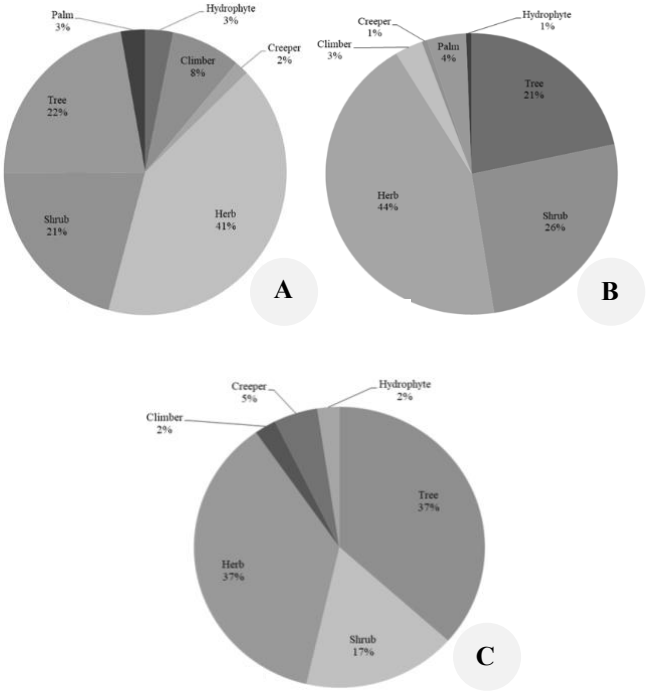

Figure 5. Spectrum of plant life-form of A. Whole TVU flora, B. 20 dominant families, and C. 11 dominant genera

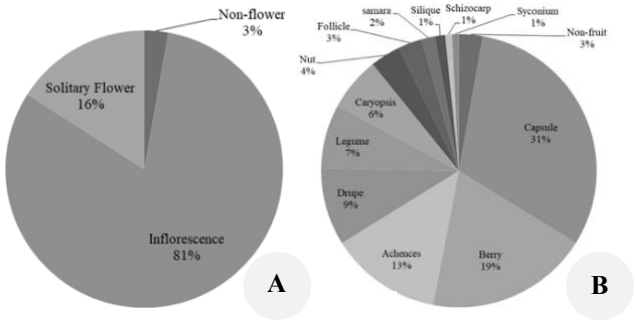

Figure 6. The diversity of TVU flora: A. Flowering type, B. Fruit type

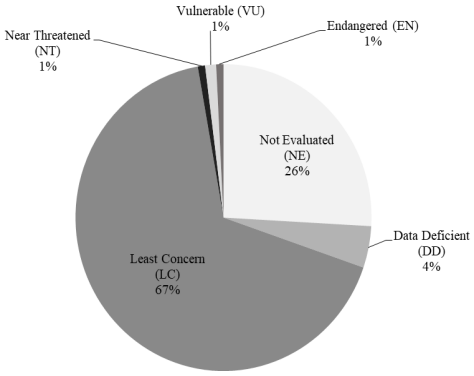

Figure 7. Diversity of conservation status of plant species in TVU flora

Table 4. Plant species diversity in terms of use-value of TVU flora

Use-value	Whole flora	
	Number of species	Percentage (%)
Medicinal plants	142	56.6
Ornamental plants	47	18.7
Food plants	42	16.7
Timber trees	16	6.4
Weed	3	1.2
Cover crop	1	0.4
Total	251	100

Table 5. Plant species diversity in terms of use-value of dominant families and genera

Use-value	20 dominant families		11 dominant genera	
	Number of species	Percentage (%)	Number of species	Percentage (%)
Medicinal plants	98	60.49	21	51.22
Ornamental plants	30	18.52	11	26.83
Food plants	18	11.11	4	9.76
Timber trees	11	6.79	5	12.20
Weed	3	1.85	0	0.00
Cover crop	1	0.62	0	0.00
Total	162	100	41	100

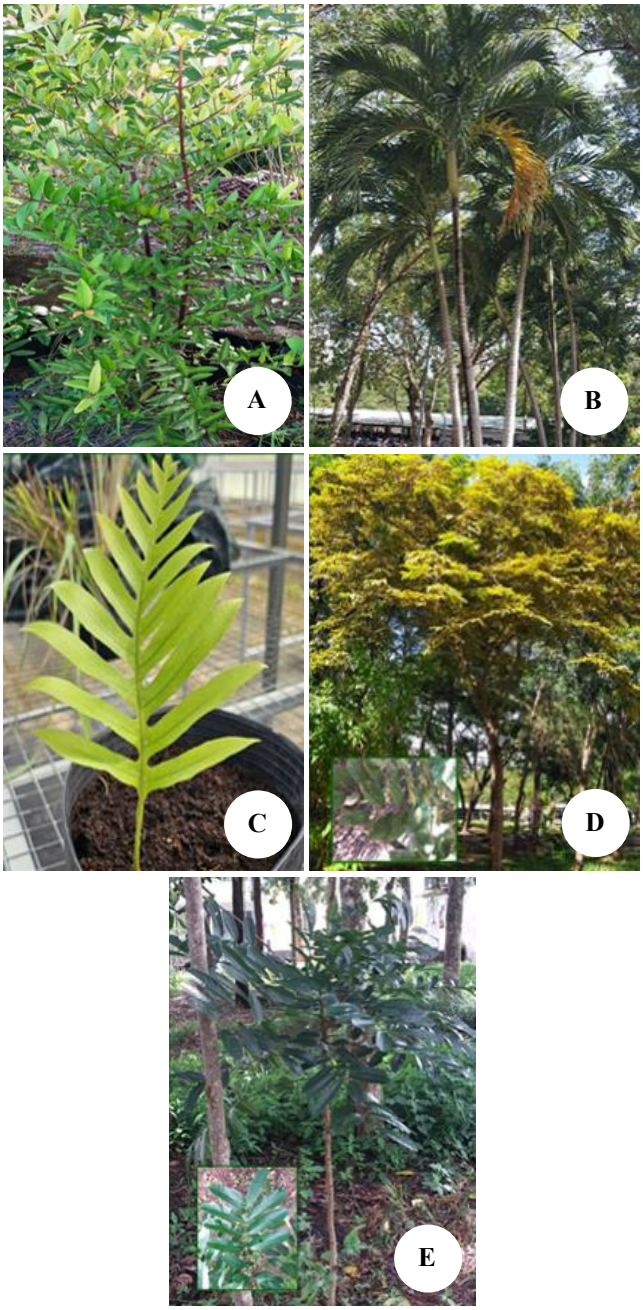

Figure 8. Threatened plant species in TVU campus according to IUCN Red List. A. *Garcinia cochinchinensis*, B. *Adonidia merrillii*, C. *Drynaria bonii*, D. *Pterocarpus macrocarpus*, E. *Khaya senegalensis*

Discussions

Diversity in floristic component and comparison with other UGSs

The floristic diversity of the Tra Vinh University (TVU) campus, comprising 251 species, 195 genera, and 74 families, demonstrates that tropical urban green spaces can support substantial plant diversity despite intensive management. Comparative diversity indices indicate that the species richness and taxonomic ratios of the TVU flora are intermediate relative to other floras in southern Vietnam, being higher than those of several smaller university campuses (Aziz et al. 2015; Parthipan et al. 2016; Soni et al. 2020; Danya and Yaazhini 2022) and urban green spaces but lower than those of large protected or semi-natural areas (Table 6). This pattern is primarily explained by differences in spatial scale, habitat heterogeneity, and management intensity rather than by ecological limitation (Aziz et al. 2015; Son et al. 2018; Yen et al. 2024).

Our findings pinpoint 143 native species of Vietnam in the TVU campus. Among these, three species are endemic to Vietnam, and four are to the Indochina region. This level of endemism is lower than that reported for several floras in southern Vietnam as Lai Son (4 species), Phu Quoc National Park (9 species), Dong Nai Culture and Nature Reserve (11), Cat Tien National Park (23), and Tan Phu Forest (41 species) (Anh 2014; Quan 2015; Hung and Alexsander 2019; Hop et al. 2024; Yen et al. 2024). In addition, the proportion of native species at TVU (57%) is lower than that of Doi Hong area (95.83%) (Hoang et al. 2018). This pattern is primarily attributable to the managed nature of the TVU campus landscape, where plant species are intentionally selected and introduced for landscaping, ornamental value, and aesthetic functions, rather than representing a largely natural or semi-natural vegetation assemblage.

Despite being a managed landscape, the taxonomic structure of the TVU flora closely resembles that of natural tropical floras in Vietnam. The dominance of Magnoliopsida over Liliopsida, reflected by a high Magnoliopsida/Liliopsida (M/L) ratio, is consistent with classical floristic principles and previous studies conducted across southern Vietnam (Ho 1999-2003; Hop et al. 2024; Yen et al. 2024). The comparable species-family and species-genus ratios shown in Table 6 further suggest that urban management does not substantially alter large-scale floristic structure when regional environmental conditions are favorable.

At the family level, Fabaceae, Poaceae, and Asteraceae were the most species-rich families, a pattern widely reported in tropical ecosystems and managed landscapes in Vietnam (Quan et al. 2012; Son et al. 2016, 2018; Hoang et al. 2018; Mai 2018; Lê et al. 2019; Luong et al. 2023). The distribution of species among families conforms to Tolmatrov's concept, whereby a limited number of families contribute disproportionately to overall species richness (less than 50%), while most families are represented by few species (rarely exceed 10%) (Hop et al. 2024). This structure indicates a floristically balanced and diverse flora despite urbanization.

At the genus level, most genera were represented by a single species, whereas a small number of genera (e.g., *Cyperus*, *Phyllanthus*, *Ficus*) accounted for a relatively high proportion of species. Such skewed genus-level distributions are characteristic of tropical floras and reflect both ecological versatility and human-mediated introductions typical of urban environments (Son et al. 2018; Yen et al. 2024). These dominant genera in the flora play important functional roles in maintaining vegetation structure and ecosystem resilience within the campus landscape.

Table 6. Comparison of diversity indices of TVU flora with some flora in the South of Vietnam

Flora	Index			Total species	Reference
	Species/Family	Species/Genus	Genus/Family		
TVU					
Whole flora	3.39	1.29	2.64	251	
Twenty dominant families	8.10	1.37	5.90		
Con Dao	6.73	1.68	4.00	1,077	Nguyet and Bau (2023)
Lại Sơn	5.14	1.52	3.37	663	Yen et al. (2024)
Ham Rong, Phu Quoc	4.15	1.64	2.53	353	Quan et al. (2012)
Cao Lanh	3.95	1.44	2.74	427	Mai (2018)
Bac Lieu	3.87	1.36	2.84	441	Son et al. (2016)
Duyen Hai	3.50	1.31	2.68	273	Son et al. (2018)
Doi Hong	1.78	1.04	1.70	96	Hoang et al. (2014)

Differences in floristic diversity between TVU and other regions in southern Vietnam can also be interpreted in light of environmental conditions. Vĩnh Long Province shares broadly similar climatic and edaphic characteristics with several species-rich regions in southern Vietnam, including a tropical monsoon climate and fertile alluvial soils (Table 7) (Mai 2018; Phuong et al. 2020; Tam and Chi 2020). Consequently, the lower species richness of the TVU campus relative to large protected areas is best attributed to limited area and management constraints rather than unfavorable climate or soil conditions, excluding Doi Hong area (Hoang et al. 2018; Thao et al. 2021).

Life-form structure of the TVU flora and urban management

The plant life-form is a crucial characteristic of plant species in the flora and a measure of the diversity of natural environments in which they grow (Allahdou et al. 2012). The life-form spectrum of the TVU flora is dominated by herbaceous species, a pattern typical of tropical urban green spaces. Herbaceous plants exhibit high ecological plasticity and are well adapted to frequent disturbance and regular maintenance, allowing them to persist and dominate in both urban and natural environments (Whigham 2004; Son et al. 2016; Spicer et al. 2022). This dominance is consistent with observations from other urban green spaces and natural ecosystems in the Mekong Delta region (Son et al. 2016, 2018; Lê et al. 2019; Yen et al. 2024).

Woody plants (trees and shrubs) constitute the second most important life-form group and contribute substantially to the structural complexity of the campus vegetation. These species are primarily cultivated for landscaping, shade provision, and microclimatic regulation, reflecting intentional human management rather than natural regeneration processes (Mai 2018; Son et al. 2018). Climbers were relatively less diverse, likely due to routine vegetation control aimed at preventing excessive competition and mechanical stress on host trees (Estrada-Villegas et al. 2020). Similar patterns of reduced climber abundance have been reported in managed urban ecosystems worldwide (Rajendran et al. 2014; Pandi 2023). Overall, the observed life-form composition reflects the combined influence of tropical climatic conditions and active vegetation management. The dominance of herbs and the controlled presence of woody plants and climbers indicate that life-form structure at TVU is shaped more by management objectives than by environmental constraints.

Diversity of use-value and ethnobotanical significance

The predominance of medicinal plants within the TVU flora highlights the strong linkage between urban green spaces and regional ethnobotanical traditions. Medicinal species represent a major component of tropical floras in Vietnam, supported by long-standing traditional knowledge systems and favorable climatic conditions (Chi 2018). Many recorded species at TVU have been scientifically validated for bioactivities consistent with their traditional uses (Tang et al. 2016; Lý et al. 2022; Thao et al. 2022).

Although the absolute number of medicinal species at TVU is lower than that reported for larger natural areas, their relative contribution to total species richness is comparable to, or higher than, that of several protected and semi-natural floras in southern Vietnam (Table 8) (Son et al. 2016; Yen et al. 2024). This comparison indicates that, despite its limited area, the TVU campus maintains a high proportion of medicinal plants relative to overall species richness. The urban green spaces, when embedded within regions of strong ethnobotanical tradition, can retain medicinal plant diversity at levels comparable to larger natural systems. Similar patterns have been reported for other university campuses and urban green spaces in Vietnam (Mai 2018; Son et al. 2018).

Ornamental plants are typically favored in campus landscapes due to their adaptability, visual appeal, and capacity to provide shade and microclimatic regulation. The strong representation of ornamental species at TVU is therefore indicative of intentional human-led floristic management, a pattern consistently reported in other urban green spaces in Vietnam (Mai 2018; Son et al. 2018). In some UGSs, ornamental plants may even dominate floristic composition, emphasizing the role of design and maintenance practices in shaping urban biodiversity. Overall, the high proportion of medicinal and ornamental plants reflects a balance between biodiversity conservation and human-centered landscape management.

Table 7. Climatic and edaphic characteristics of several study areas in the South of Vietnam

Location	Average temperature (°C)	Average humidity (%)	Average rainfall (mm)	Soil	References
Tra Vinh	~27	~85	>1,600	Alluvium and sand	Phuong et al. (2020)
Con Dao Island	~27	~90	>2,200	Sand, Feralit	Nguyen (2022)
Lai Son Island	~28	~85	>2,100	Feralit and sand	Yen et al. (2024)
Phu Quoc Island	~28	~78	>2,900	Feralit, Sand, alluvium	Thanh et al. (2018)
Cao Lanh	~30	~83	>1,500	Alluvium and sand	Mai (2018)
Bac Lieu	~27	~82	>1,700	Alluvium and sand	Dung et al. (2016)
Doi Hong	~27	~78	<900	Sand	Thao et al. (2021)

Table 8. Comparison of medicinal plant quantity of TVU flora with some floras of the south of Vietnam

Flora	Medicinal	Total number of species	Percentage (%)	References
TVU	142	251	56.6	This study
Phu Quoc (Ham Rong)	135	353	38.2	Quan et al. (2012)
Con Dao	225	1019	22.1	Huyen et al. (2021)
Duyen Hai	183	273	67.0	Son et al. (2018)
Bac Lieu	271	413	61.5	Son et al. (2016)
Cao Lanh	191	427	44.7	Mai (2018)
Lai Son	557	663	84.0	Yen et al. (2024)

Threatened species and the conservation role of the TVU campus

The presence of threatened plant species within the TVU flora underscores the conservation potential of urban green spaces in tropical regions. Several species recorded on the campus are listed under the Vietnam Red Data Book and the IUCN Red List, indicating that managed urban landscapes can function as important refugia for species of conservation concern (Ban et al. 2007; IUCN 2025). Although university campuses are not traditionally considered conservation areas, their relatively stable land use and long-term management can provide suitable conditions for the persistence of threatened species.

Species such as *D. bonii* and *P. macrocarpus*, which are threatened in the wild due to overexploitation and habitat degradation, are currently maintained under managed conditions on the TVU campus (Government of Vietnam 2021). The continued presence of these species suggests that campus environments can provide suitable conditions for their growth and survival when appropriate care, monitoring, and protection measures are applied. In this context, the TVU campus functions as a form of ex situ or quasi in situ conservation, complementing conservation efforts in natural forests. With strategic planning and long-term management, the campus could be further developed into a botanical garden dedicated to the conservation, research, and education related to native, rare and threatened species from Vietnam and the world.

Beyond their direct conservation value, the maintenance of threatened species within the TVU campus also has important educational and scientific implications. These species provide opportunities for teaching, training, and research in plant taxonomy, conservation biology, and sustainable management, thereby increasing awareness of biodiversity conservation among students and staff. Moreover, the visibility of threatened plants in public and educational setting can contribute to broader conservation awareness and promote positive attitudes toward biodiversity protection.

Overall, the conservation of threatened plant species at TVU highlights the multifunctional role of university campuses as urban green spaces that extend beyond aesthetic and recreational functions. By integrating biodiversity conservation with education and research, campuses such as TVU can play a meaningful supporting role in regional conservation strategies, particularly in landscapes where natural habitats are increasingly fragmented or under pressure.

Invasive species composition of the TVU flora

The presence of invasive alien plant species within the TVU flora reflects the vulnerability of urban green spaces to biological invasions. Urban environments are widely recognized as entry points and reservoirs for invasive species due to high levels of disturbance, frequent plant introductions, and continuous human-mediated dispersal. As a managed campus landscape, the TVU site is therefore exposed to similar invasion pressures observed in other urban green spaces in southern Vietnam.

Several invasive species recorded on the TVU campus are recognized as problematic at the national or regional level, particularly in lowland and wetland ecosystems (MONRE 2018; Trung 2021). These species are characterized by rapid growth, high reproductive capacity, and broad ecological tolerance, enabling them to establish and spread effectively in disturbed habitats. Their occurrence on the campus is likely facilitated by riverine dispersal, wind, animal-mediated seed transport, and, in some cases, intentional introduction for ornamental purposes, as previously documented for urban landscapes in the Mekong Delta.

Despite their presence, invasive species currently represent a relatively small proportion of the total flora of

the TVU campus. This suggests that active landscape management, including regular maintenance and mechanical removal, plays an important role in limiting their spread. In particular, invasive species associated with aquatic or semi-aquatic habitats appear to be more persistent, reflecting the difficulty of controlling invasions in water-associated environments compared with terrestrial landscaped areas.

The ecological impact of invasive species at TVU is therefore context-dependent. While some invasive taxa exhibit limited distribution and minimal competitive effects, others have the potential to suppress native species and alter local plant community structure if left unmanaged. This pattern highlights the importance of early detection and continuous monitoring in urban green spaces, where invasions can develop rapidly but are also more manageable than in large natural ecosystems.

In conclusion, the urban green space flora of TVU campus represents a typical tropical flora, exhibiting high diversity in species composition, life-forms, and utility. A total of 251 plant species, belonging to 195 genera, 74 families, and 2 plant divisions, were recorded, with dominant families such as Fabaceae, Poaceae, and Asteraceae also among the richest in Vietnam. Herbaceous plants were predominant, while climbers were limited by management practices. Most species were useful, particularly medicinal plants, highlighting their potential for sustainable and efficient utilization. This study provides a complete inventory of the campus flora and informs management and conservation strategies for threatened species. In the context of globalization, the rapid decline of plant species and the erosion of local knowledge make documenting and conserving floristic diversity in urban green spaces increasingly important. Such efforts not only preserve biodiversity and traditional knowledge but also enhance ecosystem services and contribute to sustainable human development. Our results also highlight the broader value of Urban Green Spaces (UGSs). As noted in the introduction, UGSs serve not only as managed landscapes but also as “living laboratories” and important refuges for biodiversity. The TVU campus exemplifies how even small, highly used urban areas can support ecological research, conservation efforts, and environmental education. Strengthening the role of UGSs in future urban planning will be essential for maintaining biodiversity in fast-growing cities.

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