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Floristic Composition, Diversity, and Dominance Patterns of Roadside and Road-Divider Vegetation in Rajshahi City Corporation, Bangladesh

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ABSTRACT

Urban roadside vegetation plays an important role in sustaining biodiversity, enhancing ecological functions, and improving the aesthetic quality of cities. This study investigated the floristic composition, diversity patterns, abundance, and functional uses of plant species occurring along roadsides and road dividers in Rajshahi City Corporation, Bangladesh, from June 2025 to January 2026. Extensive field surveys were conducted to record species identity, family, habit, taxonomic group, flowering period, and use categories, and to assess species richness, abundance, and diversity across the study area. A total of 161 plant species, representing 114 genera and 56 families, were recorded. Fabaceae was the most species-rich family (22 species), followed by Euphorbiaceae(14 species) and Arecaceae(10 species), whereas Solanaceae,Zingiberaceae, Oxalidaceae, and Lauraceaewere represented by only one species each. The recorded flora comprised 73 trees, 62 shrubs, 19 herbs, and 7 climbers, indicating the structural dominance of woody vegetation. Taxonomically, dicotyledons predominated (141 species; 87.6%), followed by monocotyledons(17 species; 10.6%) and gymnosperms (3 species; 1.9%). Most species were classified as common (58%), followed by rare (30%), very common (8%), and very rare (4%).Functional use analysis showed that the flora was dominated by ornamental species (57%), followed by medicinal (24%) and timber-related species (10%). Species diversity was highest in the C&B Road–Court Area Road site (H′ = 2.98) and lowest in the New Market–Rail Gate site (H′ = 1.08). These findings highlight the role of managed roadside vegetation as a structurally dominant yet compositionally selective component of urban green infrastructure in Rajshahi.

Keywords: *Roadside vegetation; Floristic composition; Urban plant diversity; Shannon–Wiener diversity index; Importance value index;Urban green infrastructure.*

Introduction

Urban vegetation is increasingly recognized as an important component of sustainable urban development because it supports biodiversity, improves environmental quality, provides ecosystem services, and contributes to human well-being[1–3]. In rapidly urbanizing landscapes, natural and semi-natural habitats are frequently fragmented, simplified, or replaced by impervious surfaces, resulting in marked changes in species composition, vegetation structure, and ecosystem functioning[4–6]. Within this context, roadside verges and central medians represent ecologically meaningful elements of urban green infrastructure[7]. Although these spaces are often established primarily for beautification, shading, and traffic management,

they also provide important ecosystem services, including microclimatic regulation, dust interception, carbon storage, soil stabilization, and habitat resources for pollinators and other urban biota[8–11]. Consequently, roadside vegetation should be regarded not merely as ornamental planting, but as an integral component of the urban ecological network.

The ecological significance of roadside and median vegetation is particularly pronounced in tropical and subtropical cities, where urban heat, traffic-related particulate pollution, and rapid land-use conversion intensify environmental stress[12–14]. In such settings, roadside plant assemblages are typically shaped by deliberate planting, management practices, environmental filtering, and species-specific tolerance to drought, heat, pollution, and disturbance[15–17]. This often results in floras dominated by a limited set of hardy and visually attractive species. While such species may perform well under stressful urban conditions, excessive reliance on a narrow planting palette can promote compositional homogenization, reduce structural heterogeneity, and ultimately constrain the ecological resilience and conservation value of urban green spaces[18–20]. Therefore, evaluating roadside vegetation requires more than a simple inventory of planted taxa; it requires an integrated assessment of floristic composition, life-form structure, abundance status, dominance patterns, and functional uses[21].

Rajshahi City Corporation (RCC), a major metropolitan area in northwestern Bangladesh, provides a particularly relevant context for such an investigation[22].

Rajshahi has undergone sustained urban expansion, yet it is also widely recognized for its emphasis on urban greening through planned roadside and road-divider plantations[23]. These vegetated strips now constitute a visible and functionally important part of the city's green infrastructure. Such plantations are commonly promoted to improve environmental quality by reducing dust, moderating urban heat, stabilizing roadside soils, and enhancing visual amenity across major urban corridors[24]. The study area is therefore especially suitable for examining how managed roadside vegetation contributes to urban biodiversity patterns within an urban landscape of Bangladesh[25].

Despite the ecological and managerial importance of these linear green spaces, a clear research gap remains. Urban plant studies in Bangladesh have largely focused either on broader metropolitan floras or on roadside vegetation in other cities, whereas a dedicated quantitative assessment of roadside and central-median vegetation in Rajshahi remains limited[23,26]. In particular, an integrated account for RCC that simultaneously documents species composition, family-level representation, growth-form structure, abundance categories, functional use patterns, dominant taxa, and spatial variation in diversity across the road network has been lacking in the available local context. This gap limits the capacity of city authorities and urban planners to evaluate whether existing plantation practices are taxonomically diverse, ecologically balanced, or overly dependent on a small set of dominant ornamental species. It also constrains evidence-based decisions regarding species selection, native species integration, and biodiversity-sensitive roadside plantation design.

Addressing this gap is important from both scientific and management perspectives. Scientifically, a systematic floristic assessment of roadside and median vegetation can improve understanding of how urbanization and planting practices shape local plant assemblages[27,28]. From a practical perspective, such information is essential for designing roadside plantations that balance aesthetic value with ecological functionality[8,9,29]. In a city such as Rajshahi, where roadside and divider plantations form a prominent component of the urban landscape, baseline data on species diversity and vegetation structure are crucial for developing sustainable greening strategies and for reducing the risk of ecological homogenization associated with repetitive planting schemes[30].

Against this background, the present study aimed to assess the floristic composition, diversity structure, abundance patterns, and functional uses of plant species occurring along roadsides and road dividers within Rajshahi City Corporation, Bangladesh. It documents the plant species present in these habitats, characterizes their taxonomic and structural attributes, and evaluates their habit, taxonomic group, flowering period, abundance status, and use categories. In addition, the study quantifies species richness, abundance, and diversity across the surveyed sites. By providing a systematic inventory of roadside vegetation in RCC, this research establishes a baseline for urban biodiversity conservation, evidence-based plantation planning, and ecologically informed management of roadside green infrastructure in Rajshahi.

Materials and methods

Study area

The study was conducted in Rajshahi City Corporation (RCC), Bangladesh, from June 2025 to January 2026.

RCC is a major metropolitan area in northwestern Bangladesh, located between 24°20′ and 24°24′ N latitude and 88°32′ and 88°40′ E longitude. The city lies within the Barind Tract and the northern Bengal plain and has undergone substantial urban expansion in recent decades. Alongside this expansion, RCC has developed an extensive network of roadside and central-median plantations as part of its urban greening initiatives. These planted strips now represent an important component of the city's urban green infrastructure. Rajshahi experiences a tropical wet-and-dry climate, with summer temperatures often exceeding 40 °C, annual rainfall of approximately 1,500 mm, and predominantly alluvial to clayey soils with mildly acidic to alkaline reaction. These climatic, edaphic, and management conditions make RCC a suitable urban system for assessing roadside and road-divider vegetation diversity.

Survey design and field sampling

A city-wide floristic survey was conducted through 20 field visits during the study period. Sampling covered 20 major roadside and road-divider corridors across RCC: Rajshahi University–Talaimari, Talaimari–Shaheb Bazar Main Road, Rajshahi College–C&B Road, C&B Road–Court Area Road, Court Area Road–Kashiadanga Bypass, Kashiadanga Bypass–Rajshahi Medical, Bornali–Rail Gate, Rail Station–Talaimari Traffic Point, Sapura–Shalbagan Road, Stadium–Aam Chattar, Aam Chattar–Airport, Uposhahar Main Road sector dividers, Vodra Mor–Budhpara Flyover Road, Padma River Embankment, Terokhadia–Cantonment Road, University Main Gate–Katakhali, Meherchandi–Binodpur, Kharkhori–Biman Bandar Road, Octroi More–Koroitola More, and New Market–Rail Gate.

At each corridor, 10 sampling locations were selected randomly, and vegetation was surveyed using 15-m line transects. In total, 200 line transects were surveyed across the 20 road corridors. Within each transect, all plant species occurring along the roadside and road-divider vegetation were recorded, and the number of individuals of each species was counted. The line-transect approach was used because roadside verges and central medians are narrow, elongated habitats[31]. Surveys were conducted across available flowering and fruiting periods whenever possible to improve field recognition and taxonomic verification.

Field documentation

During fieldwork, observations were recorded for each plant species, including scientific name, local name, family, growth habit, flowering period, abundance status, taxonomic group, and use category. Field notes were maintained throughout the survey, and representative individuals and plant stands were photographed to support post-field verification. This combination of direct observation, field notes, and photographic documentation was used to compile the floristic inventory and reduce uncertainty during subsequent identification.

Taxonomic identification and nomenclature

Plant taxa were identified to species level, where possible, using standard floristic and taxonomic literature, including Hooker (1877)[32], Prain (1903)[33], Cronquist (1981)[34], and Kirtikar and Basu (1987)[35]. Nomenclature was subsequently checked and updated using Huq (1986)[36], Pasha and Zaman (1988), Ahmed et al. (2008, 2009)[37], and Pasha and Uddin (2013)[38].

After identification, each species was assigned to the appropriate family, habit class, taxonomic group, abundance category, and functional use category.

Data classification

The recorded flora was classified according to structural, taxonomic, abundance, and functional attributes. Growth habit was categorized as tree, shrub, herb, or climber. Taxonomic grouping followed the broad categories of dicotyledons, monocotyledons, and gymnosperms. Species occurrence status was categorized as very common, common, rare, and very rare based on field occurrence across the sampled transects and road corridors. In this study, these abundance categories were used as relative field-status classes rather than formal population-size estimates. Functional use categories were assigned based on field observations and available ethnobotanical literature, and included ornamental, medicinal, food, edible, timber, landscaping, ecological, cosmetic, and multipurpose uses.

Quantitative analysis

Vegetation structure was quantified using standard phytosociological parameters, including frequency (F), relative frequency (RF), density (D), relative density (RD), abundance (A), relative abundance (RA), and Importance Value Index (IVI). These metrics were used to describe species occurrence, structural contribution, and ecological dominance within roadside and road-divider vegetation. Frequency measured the proportion of sampling units in which a species occurred, thereby reflecting its distribution within the study area. Density represented the number of individuals of a species per sampling unit, whereas abundance expressed the mean number of individuals per occupied sampling unit. Relative values were calculated to determine the proportional contribution of each species to total community structure. IVI was used as a composite measure of species dominance and was calculated as the sum of relative frequency, relative
density, and relative abundance. Species with higher IVI values were considered more dominant within the sampled vegetation. The phytosociological parameters were calculated using the following equations:

$$\text{Frequency (F)} = \frac{\text{Number of sampling units in which a species occurred}}{\text{Total number of sampling units}} \times 100$$

$$\text{Relative frequency (F)} = \frac{\text{Frequency of a species}}{\Sigma \text{ Frequency of all species}} \times 100$$

$$\text{Density (D)} = \frac{\text{Total number of individuals of a species}}{\text{Total number of sampling units}}$$

$$\text{Relative density (RD)} = \frac{\text{Density of a species}}{\Sigma \text{ Density of all species}} \times 100$$

$$\text{Abundance (A)} = \frac{\text{Total number of individuals of a species}}{\text{(Number of sampling units in which the species occured)}}$$

$$\text{Relative abundance (RA)} = \frac{\text{Abundance of a species}}{\Sigma \text{ Abundance of all species}} \times 100$$

Importance Value Index (IVI) = RF + RD + RA

Species diversity was assessed using the Shannon–Wiener diversity index[39,40]:

$$H' = -\boldsymbol{\Sigma}\, \mathbf{pi} \ln(\mathbf{pi})$$

where $\mathbf{H'}$ is the Shannon–Wiener diversity index and **pi** is the proportional abundance of the *i*th species. This index incorporates both species richness and relative abundance and was used to compare diversity patterns among the surveyed road corridors. Species richness and total abundance were also summarized for each site to evaluate spatial variation in floristic composition across Rajshahi City Corporation.

Results

Floristic composition of roadside and road-divider vegetation

The floristic survey conducted across roadside and road-divider habitats within Rajshahi City Corporation recorded a total of 161 plant species belonging to 114 genera and 56 families, indicating considerable taxonomic richness within the urban roadside flora of the study area. The complete floristic inventory, including scientific name, family, local name, habit, taxonomic group, abundance status, use category, and flowering period, is presented in Table 1. Family-level analysis revealed that Fabaceae was the most species-rich family, represented by 22 species, followed by Euphorbiaceae (14 species) and Arecaceae (10 species). Other comparatively well-represented families included Meliaceae (6 species), Verbenaceae (5 species), and Lythraceae and Rutaceae (4 species each), whereas Lauraceae, Oxalidaceae, Solanaceae, and Zingiberaceae were each represented by a single species. The family-wise distribution of species is illustrated in Fig. 1, which shows that a limited number of families contributed disproportionately to overall species richness.

Table 1: Floristic inventory of plant species recorded from roadsides and road dividers in Rajshahi City Corporation, including family, local name, habit, taxonomic group, abundance status, use category, and flowering period.

Sl. No.	Scientific Name	Family	Local Name	Habit	Group	Abundance	Uses	Flowering Time
1	*Barleria cristata* L.	Acanthaceae	Philippine Violet	Shrub	Dicot	C	Ornamental	Sep-Dec
2	*Justicia adhatoda* L.	Acanthaceae	Basak	Shrub	Dicot	C	Medicinal	Jan-Dec
3	*Sanchezia speciosa* Leonard	Acanthaceae	Zebra Plant	Shrub	Dicot	C	Ornamental	Jan-Dec
4	*Alternanthera brasiliana (L.) Kuntze*	Amaranthaceae	Ruby leaf	Herb	Dicot	Vc	Ornamental	Jan-Dec
5	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae	Malancha	Herb	Dicot	C	Medicinal	Dec-Mar
6	*Celosia argentea var. cristata* (L.) Kuntze	Amaranthaceae	morogful	Herb	Dicot	C	Ornamental	Sep-Jan
7	*Mangifera indica* L.	Anacardiaceae	Aam	Tree	Dicot	C	Edible fruit	Dec-Mar
8	*Spondias pinnata* (L. f.) Kurz	Anacardiaceae	Amra	Tree	Dicot	R	Edible	Mar-May
9	*Polyalthia longifolia*(Sonn.) Thwaites	Annonaceae	Debdaru	Tree	Dicot	C	Fruit, timber/fuel	Dec-Apr
10	*Centella asiatica* (L.) Urb.	Apiaceae	Thankuni	Herb	Dicot	C	Medicinal	Apr-Jun
11	*Allamanda cathartica* L.	Apocynaceae	Yellow Allamanda	Shrub	Dicot	R	Ornamental	Jan-Dec
12	*Alstoniascholaris* (L.) R. Br.	Apocynaceae	Chatim	Tree	Dicot	C	Medicinal	Jan-Dec
13	*Calotropis gigantea* (L.) W.T. Aiton	Apocynaceae	Akanda	Herb	Dicot	C	Ornamental, medicinal	Nov-Apr
14	*Carissa carandas* L.	Apocynaceae	Karaunda	Shrub	Dicot	C	Ornamental	Mar-May
15	*Cascabelathevetia*(L.) Lippold	Apocynaceae	Korobi	Tree	Dicot	C	Ornamental	Nov-Jan
16	*Catharanthus roseus* (L.) G. Don	Apocynaceae	Nayantara plant	Shrub	Dicot	Vc	Ornamental	Jun-Oct
17	*CryptostegiagrandifloraR.Br.*	Apocynaceae	Allamanda	Climber	Dicot	C	Ornamental	Jan-Dec
18	*Holarrhena antidysenterica* (L.) Wall.	Apocynaceae	Kurchi	Tree	Dicot	C	Medicinal	Apr-Jul
19	*Nerium oleander* L.	Apocynaceae	Karabi	Shrub	Dicot	Vc	Ornamental, medicinal	Jan-Dec
20	*Plumeria alba* L.	Apocynaceae	White Frangipani	Shrub	Dicot	R	Ornamental	Apr-Jun
21	*Plumeria pudica* Jacq.	Apocynaceae	Bridal Bouquet	Shrub	Dicot	C	Ornamental	Nov-Jan
22	*Plumeria rubra* L.	Apocynaceae	Pagoda Tree	Shrub	Dicot	R	Ornamental	Jan-Jul
23	*Tabernaemontanacorymbosa*Roxb. ex Wall.	Apocynaceae	Noyontara	Shrub	Dicot	C	Modern medicine	Jan-Dec
24	*Tabernaemontanadivaricata* (L.) R.Br.	Apocynaceae	Bamontagor	Shrub	Dicot	C	Ornamental	Jan-Dec
25	*Areca catechu* L.	Arecaceae	Supari	Tree	Monocot	C	Ornamental, medicinal	Jan-Dec
26	*CaryotamitisLour.*	Arecaceae	Fishtail palm	Tree	Monocot	C	Ornamental	Mar- Jun
27	*Chrysalidocarpuslutescens*Wendland	Arecaceae	Golden cane palm	Tree	Monocot	R	Ornamental	Mar- Jun
28	*Cocos nucifera* L.	Arecaceae	Daab	Tree	Monocot	C	Food/drink	Dec-Mar
29	*Coryphaumbraculifera*L	Arecaceae	Tali plam	Tree	Monocot	R	Ornamental	Jan-Dec
30	*Roystonea regia* (Kunth) O.F.Cook	Arecaceae	Palm	Tree	Monocot	R	Ornamental	Jan-Dec
31	*Asparagus aethiopicus* L.	Asparagaceae	Satamuli	Climber	Monocot	C	Medicinal	Jul-Aug
32	*Asparagus racemosus* Willd.	Asparagaceae	Sotomoli	Climber	Monocot	C	Medicinal	Jul-Aug
33	*Chrysanthemum indicum* L.	Asteraceae	Haimanti	Herb	Dicot	C	Ornamental	Oct-Dec
34	*Helianthus annuus* L.	Asteraceae	Sunflower	Herb	Dicot	C	Medicinal, ornamental	Apr-Dec
35	*Tridax procumbens* L.	Asteraceae	Tridhara	Herb	Dicot	C	Ornamental	Jan-Dec
36	*Vernonia elaeagnifolia* DC.	Asteraceae	Parda Bel	Climber	Dicot	C	Medicinal	Apr-Jun
37	*Pyrostegia venusta* (Ker Gawl.) Miers	Bignoniaceae	Flame Vine	Climber	Dicot	C	Ornamental	Nov-Apr
38	*Tabebuia haemantha* (Bertol. ex Spreng.) DC.	Bignoniaceae	Blood-Red Trumpet Tree	Tree	Dicot	R	Ornamental	Feb-Apr
39	*Tecoma stans*(L.) Juss. ex Kunth	Bignoniaceae	Hoimonti	Tree	Dicot	Vc	Ornamental	Feb-Apr
40	*Bixa orellana* L.	Bixaceae	Sinduri	Shrub	Dicot	R	Dye/cosmetic	Aug-Dec
41	*Opuntia ficus-indica* (L.) Mill.	Cactaceae	Cactus	Herb	Dicot	R	Ornamental	Dec-Apr
42	*Mesua ferrea* L.	Calophyllaceae	Nagkesar	Tree	Dicot	C	Medicinal	Oct-Nov
43	*Canna indica* L.	Cannaceae	Kolaboti	Herb	Monocot	C	Ornamental	Jul-Oct
44	*Lonicera sempervirens* L.	Caprifoliaceae	Woodbine	Cry	Dicot	C	Timber	Mar-Jun
45	*Dianthus caryophyllus* L.	Caryophyllaceae	Dayanthus	Herb	Dicot	Vc	Ornamental	May-Oct
46	*Casuarina equisetifolia* L.	Casuarinaceae	Jhau	Tree	Gymnosperms	C	Timber	Feb-Apr
47	*Terminalia arjuna* (Roxb.) Wight & Arn.	Combretaceae	Arjun	Tree	Dicot	R	Medicinal	Mar-May
48	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Bohera	Tree	Dicot	R	Medicinal	Mar-May
49	*Terminalia chebula* Retz.	Combretaceae	Haritoki	Tree	Dicot	R	Medicinal	Apr-Jun
50	*Thuja occidentalis* L.	Cupressaceae	Thuja	Shrub	Gymnosperms	C	Landscaping	Apr-May
51	*Dillenia indica* L.	Dilleniaceae	Chalta	Tree	Dicot	R	Medicinal, culinary	May-Aug
52	*Diospyros montana*Roxb.	Ebenaceae	Tamal	Tree	Dicot	R	Ornamental	Mar-May
53	*Elaeocarpus serratus* L.	Elaeocarpaceae	Jolpai	Tree	Dicot	R	Ornamental	Apr-May
54	*Acalypha hispida* Burm.f.	Euphorbiaceae	Shibjota	Shrub	Dicot	C	Ornamental	Feb-Jan
55	*Acalypha wilkesiana* Müll. Arg.	Euphorbiaceae	Muktajhuri	Shrub	Dicot	C	Ornamental	Jan-Dec

56	*Codiaeum variegatum* (L.) Rumph.	Euphorbiaceae	Patabahar	Shrub	Dicot	C	Ornamental	Feb-Jan
57	*Euphorbia antiquorum* L.	Euphorbiaceae	Bajbaran	Shrub	Dicot	R	Medicinal, horticulture	Dec-Apr
58	*Euphorbia cotinifolia* L.	Euphorbiaceae	Red Spurge	Tree	Dicot	R	Medicinal, ornamental	Jun-Aug
59	*Euphorbia milii* Des Moul.	Euphorbiaceae	Crown	Shrub	Dicot	C	Medicinal, ornamental	Jan-Dec
60	*Euphorbia pulcherrima* Willd.	Euphorbiaceae	Poinsettia	Shrub	Dicot	C	Ornamental	Dec-Mar
61	*Euphorbia thymifolia* L.	Euphorbiaceae	Choti-dudh	Shrub	Dicot	Vc	Ornamental	Jun-Nov
62	*Euphorbia tirucalli* L.	Euphorbiaceae	Milk Bush	Shrub	Dicot	C	Ornamental, medicinal	May-Jul
63	*Euphorbia tithymaloides* L.	Euphorbiaceae	Zigzag Plant	Shrub	Dicot	C	Ornamental	Apr-Jun
64	*Jatropha curcas* L.	Euphorbiaceae	Bubble bush	Shrub	Dicot	C	Ornamental	Apr-Nov
65	*Jatropha gossypifolia* L.	Euphorbiaceae	Bellyache bush	Shrub	Dicot	C	Ornamental	Apr-Nov
66	*Ricinus communis* L.	Euphorbiaceae	Rerhi	Shrub	Dicot	R	Medicinal	Jan-Dec
67	*Calliandra haematocephala*Hassk.	Fabaceae	Powder Puff	Shrub	Dicot	C	Ornamental	Apr-Jul
68	*Acacia auriculiformis* Benth.	Fabaceae	Akasmoni	Tree	Dicot	Vc	Furniture	Feb-Aug
69	*Adenantherapavonina* L	Fabaceae	Seawtchondan	Tree	Dicot	R	Ornamental	Oct- Feb
70	*Albizia procera* (Roxb.) Benth.	Fabaceae	Koroi tree	Tree	Dicot	C	Timber	Feb -Apr
71	*Bauhinia variegata* L.	Fabaceae	Rakta Kanchan	Tree	Dicot	Vr	Ornamental	Sep-Dec
72	*Chrysalidocarpuslutescens*Wendland	Fabaceae	Kanchan	Tree	Dicot	C	Ornamental	Feb-Apr
73	*Bombax ceiba*L.	Fabaceae	Shimul	Tree	Dicot	C	Ornamental	Feb -Apr
74	*Butea monosperma* (Lam.) Taub.	Fabaceae	Palash	Tree	Dicot	C	Medicinal	Feb-Mar
75	*Caesalpinia pulcherrima* (L.) Sw.	Fabaceae	Radhachura	Shrub	Dicot	C	Ornamental	Apr-Sep
76	*Cassia fistula* L.	Fabaceae	Sonalu	Tree	Dicot	R	Ornamental, medicinal	Apr-Jul
77	*Cassia javanica* L.	Fabaceae	Java cassia	Tree	Dicot	C	Ornamental	Feb -Apr
78	*Clitoriaternatea* L.	Fabaceae	Oporajita	Climber	Dicot	C	Ornamental	Jun-Feb
79	*Dalbergia sissoo* DC.	Fabaceae	Sisugach	Tree	Dicot	R	High-quality timber	Mar-May
80	*Delonix regia* (Hook.) Raf.	Fabaceae	Krishnachura	Tree	Dicot	C	Ornamental	Apr-Jun
81	*Erythrina variegata* L.	Fabaceae	Mandar tree	Tree	Dicot	C	Landscaping	Feb -Apr
82	*Jacaranda mimosifolia*D. Don	Fabaceae	Niljhuri	Tree	Dicot	R	Ornamental	Apr-Jun
83	*Mimosa pudica* L.	Fabaceae	Lojjaboti	Herb	Dicot	R	Ornamental	Jul-Dec
84	*Peltophorumpterocarpum*(DC.) Backer ex	Fabaceae	Radhachura	Tree	Dicot	C	Ornamental	Feb -Apr
85	*Pongamia pinnata* (L.) Pierre	Fabaceae	Karanja	Tree	Dicot	C	Landscaping	Apr- Jun
86	*Samanea saman*(Jacq.) Merr.	Fabaceae	Rain tree	Tree	Dicot	C	Timber	Feb -Apr
87	*Senna alata* (L.) Roxb.	Fabaceae	Dadmurdan	Shrub	Dicot	R	Ornamental	Sep-Jan
88	*Senna spectabilis*(DC.) Irwin & Barneby	Fabaceae	American cassia	Tree	Dicot	C	Ornamental	Feb -Apr
89	*Heliconia rostrata* Ruiz & Pav.	Heliconiaceae	Lobster-claw	Herb	Monocot	C	Ornamental	May-Aug
90	*Volkameria angulata*Lour	Lamiaceae	Chinese Glory Bower	Shrub	Dicot	C	Ornamental	Jan-Dec
91	*Clerodendrum inermis* L.	Lamiaceae	Bon-jui	Shrub	Dicot	C	Landscaping & fencing	Jan-Dec
92	*Ocimum tenuiflorum* L.	Lamiaceae	Tulsi	Herb	Dicot	R	Medicinal	Sep-Feb
93	*Cinnamomum tamala* (Buch.-Ham.)	Lauraceae	Tejpata	Tree	Dicot	R	Medicinal	Jan-Mar
94	*Barringtonia acutangula* (L.) Gaertn.	Lecythidaceae	Hijal	Tree	Dicot	Vr	Medicinal	Apr-Jun
95	*Couroupitaguianensis*Aubl.	Lecythidaceae	Naglinga	Tree	Dicot	Vr	Medicinal, timber	April -July
96	*Lagerstroemia indica*L.	Lythraceae	Coto jarul	Tree	Dicot	C	Ornamental	Apr-Jun
97	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	Jarul tree	Tree	Dicot	C	Ornamenta	Apr-Jun
98	*Lawsonia inermis* L.	Lythraceae	Mehedi	Shrub	Dicot	R	Medicinal	Jun-Oct
99	*Punica granatum* L.	Lythraceae	Dalim	Shrub	Dicot	R	Multipurpose	Mar-May
100	*Hiptage benghalensis* (L.) Kurz	Malpighiaceae	Madhavi Lata	Climber	Dicot	C	Medicinal, ornamental	Feb-Apr
101	*Malvaviscusarboreus* Cav.	Malvaceae	Morich joba	Shrub	Dicot	Vc	Ornamental	Jan-Dec
102	*Abelmoschus esculentus*(L.) Moench	Malvaceae	Dheros	Shrub	Dicot	C	Ornamental	Jan-Dec
103	*Abroma augusta* (L.) L. f.	Malvaceae	ulatkombal	Shrub	Dicot	Vr	Ornamental	Jun-Oct
104	*Alcea rosea* L.	Malvaceae	Hollyhocks	Shrub	Dicot	C	Ornamental	Jun-Sep
105	*Grewia asiatica*L.	Malvaceae	Falsha	Shrub	Dicot	R	Ornamental & food	Apr-Jun
106	*Hibiscus acetosella*Welw. ex Hiern.	Malvaceae	Mesta joba	Shrub	Dicot	C	Ornamental	Jan-Dec
107	*Hibiscus moscheutos*L.	Malvaceae	Begunijoba	Shrub	Dicot	C	Ornamental	Jan-Dec
108	*Hibiscus mutabilis*L.	Malvaceae	Sthal padda	Shrub	Dicot	C	Ornamental	Jan-Dec
109	*Hibiscus rosa-sinensis* L.	Malvaceae	Joba	Shrub	Dicot	C	Ornamental, medicinal	Jan-Dec
110	*Hibiscus schizopetalus*(Dyer) Hook.f.	Malvaceae	Lonthon joba	Shrub	Dicot	R	Ornamental	Jan-Dec
111	*Azadirachta indica* A. Juss.	Meliaceae	Neem	Tree	Dicot	C	Medicinal	Jan-May
112	*Melia azedarach* L.	Meliaceae	Pahari neem	Tree	Dicot	Vr	Medicinal	Mar-May

113	*Swietenia macrophylla* King	Meliaceae	Mahogany	Tree	Dicot	C	Timber medicinal	Mar-May
114	*Swietenia mahagoni* (L.) Jacq.	Meliaceae	Mahogany	Tree	Dicot	R	Timber medicinal	Apr-Jun
115	*Toona ciliata* M. Roem.	Meliaceae	Red Cedar	Tree	Dicot	C	Timber medicinal	Nov-Jan
116	*Artocarpus heterophyllus* Lam.	Moraceae	Jackfruit	Tree	Dicot	R	Timber	Dec-Mar
117	*Artocarpus lacucha*Buch.-Ham	Moraceae	Bon kathal	Tree	Dicot	R	Ornamental & food	April - Jun
118	*Artocarpus altilis*(Parkinson) Fosberg	Moraceae	Dewa	Tree	Dicot	R	Ornamental & food	Dec-Apr
119	*Ficus benghalensis* L.	Moraceae	Bot	Tree	Dicot	R	Ecological	Jan-Dec
120	*Ficus benjamina* L.	Moraceae	Pakur	Tree	Dicot	C	Timber	Feb-Apr
121	*Ficus virens* Aiton	Moraceae	Pilkhan	Tree	Dicot	C	-	Apr-Oct
122	*Moringa oleifera* Lam.	Moringaceae	Sojina	Tree	Dicot	C	Medicinal	Feb-Jun
123	*Callistemon citrinus* (Curtis) Skeels	Myrtaceae	Bottle brush	Shrub	Dicot	C	Ornamental	Jan-Dec
124	*Callistemon viminalis* (Sol. ex Gaertn.) G.Don	Myrtaceae	Bottlebrush	Tree	Dicot	C	Ornamental gardening	Nov-Apr
125	*Psidium guajava* L.	Myrtaceae	Peyera	Tree	Dicot	R	Food & ornamental	Mar-Apr
126	*Syzygiumjambos* (L.) Alston	Myrtaceae	Golap Jam	Tree	Dicot	R	Edible, medicinal	Feb-Apr
127	*Bougainvillea spectabilis* Willd.	Nyctaginaceae	Baganbilas	Shrub	Dicot	C	Ornamental	Jan-Dec
128	*Mirabilis jalapa* L.	Nyctaginaceae	Sondhamaloti	Herb	Dicot	C	Ornamental	May-Dec
129	*Nelumbo nucifera*Gaertn.	Nymphaeaceae	Sacred Lotus	Herb	Dicot	Vr	Ornamental	Jun-Aug
130	*Jasminum multiflorum*(Burm. f.) Andrews	Oleaceae	Kunda	Shrub	Dicot	R	Ornamental	Aug-Nov
131	*Jasminum sambac* (L.) Aiton	Oleaceae	Beli Phool	Shrub	Dicot	C	Ornamental	Feb-Oct
132	*Nyctanthes arbor-tristis* L.	Oleaceae	Sheuli	Tree	Dicot	C	Ornamental	Aug-Dec
133	*Averrhoa carambola* L.	Oxalidaceae	Kamranga	Tree	Dicot	C	Medicinal	Jan-Dec
134	*Pinus roxburghii*Sarg.	Pinaceae	Pinus	Tree	Gymnosperms	R	Landscapin ornamental g	Jan-Dec
135	*Russeliaequisetiformis*Schltdl.	Plantaginaceae	Pakhiful	Shrub	Dicot	C	Ornamental	Jan-Dec
136	*Bambusa balcooa*Roxb.	Poaceae	Bamboo	Shrub	Monocot	C	Industry, food	30-35yr
137	*Bambusa nutans* Wall. ex Munro	Poaceae	Kanchi bans	Shrub	Monocot	R	Ornamental	30-50yr
138	*Bambusa tulda*Roxb.	Poaceae	Bamboo	Shrub	Monocot	C	Industry, food	30-35yr
139	*Cynodondactylon* (L.) Pers.	Poaceae	durba	Herb	Monocot	Vc	Ornamental	Jan-Dec
140	*Saccharum spontaneum* L.	Poaceae	Kasful	Shrub	Monocot	C	Ornamental	Aug-Oct
141	*Ziziphus mauritiana* Lam.	Rhamnaceae	Boroi	Tree	Dicot	R	Multipurpose	Jul-Sep
142	*Prunus avium* (L.) L.	Rosaceae	Sweet Cherry	Tree	Dicot	C	Timber ornamental	Apr-May
143	*Prunus cerasus* L.	Rosaceae	Sour Cherry	Tree	Dicot	C	Timber, ornamental	Apr-May
144	*Rosa centifolia* L.	Rosaceae	Golap	Shrub	Dicot	C	Ornamental	Jan-Dec
145	*Ixora coccinea* L.	Rubiaceae	Ronggon	Shrub	Dicot	Vc	Ornamental	Apr-Dec
146	*Mussaendaerythrophylla*Schumach.	Rubiaceae	Mussaenda	Shrub	Dicot	C	Ornamental	Jan-Dec
147	*Neolamarckiacadamba* (Roxb.) Bosser	Rubiaceae	kodom	Tree	Dicot	C	Industrial, ornamental	Jun-Aug
148	*Aegle marmelos* (L.) Correa	Rutaceae	Bel	Tree	Dicot	C	Ornamental & food	Apr-Jun
149	*Citrus limon* (L.) Osbeck	Rutaceae	Lebu	Tree	Dicot	Vc	Medicinal	Mar-Sep
150	*Citrus maxima* (Burm.) Merr.	Rutaceae	Jambura	Tree	Dicot	R	Medicinal	Feb-Apr
151	*Murraya paniculata* (L.) Jack	Rutaceae	Kamini	Shrub	Dicot	C	Ornamental	Nov-Feb
152	*Manilkara zapota* (L.) P. Royen	Sapotaceae	Sapodilla	Tree	Dicot	C	Ornamental	Jan-Dec
153	*Mimusopselengi* L.	Sapotaceae	Bakul	Tree	Dicot	C	Multipurpose	Mar-July
154	*Cestrum nocturnum* L.	Solanaceae	Hasna Hena	Shrub	Dicot	C	Ornamental	Apr-Jul
155	*Ravenala madagascariensis* Sonn.	Strelitziaceae	Traveller's Palm	Herb	Monocot	R	Ornamental	Jan-Dec
156	*Clerodendrum chinense*(Osbeck) Mabb.	Verbenaceae	Hajar beli	Shrub	Dicot	R	Ornamental	Aug-Jan
157	*Clerodendrum indicum* (L.) Kuntze	Verbenaceae	Tubeflower	Shrub	Dicot	R	Ornamental	July-Oct
158	*Clerodendrum inerme* (L.) Gaertn.	Verbenaceae	Glory Bower	Shrub	Dicot	Vc	Ornamental	Aug-Jan
159	*Durantaerecta*L.	Verbenaceae	Kata mehedi	Shrub	Dicot	Vc	Ornamental	Aug-Jan
160	*Lantana camara* L.	Verbenaceae	Lantana	Shrub	Dicot	Vc	Ornamental, medicinal	Jan-Dec
161	*Hedychium coronarium*J.König	Zingiberaceae	Butterfly Ginger	Herb	Monocot	R	Medicinal ornamental	Aug-Nov

[C=Common, Vc =Very Common, R=Rare, and Vr=Very Rare]

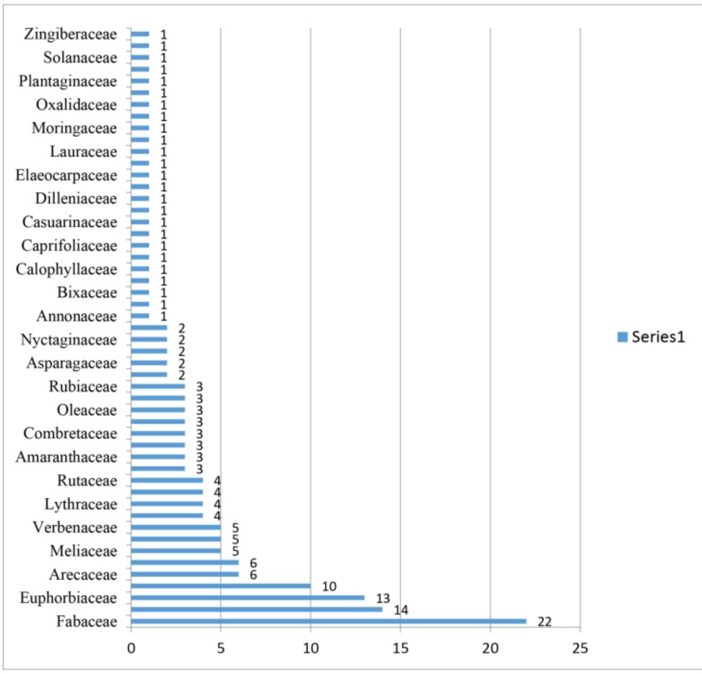

Fig. 1: Family-wise distribution of the number of plant species recorded from roadside and road-divider habitats in Rajshahi City Corporation, Bangladesh.

Growth-form composition and taxonomic structure

The recorded flora was structurally dominated by woody species. Of the 161 species, 73 were classified as trees, 62 as shrubs, 19 as herbs, and 7 as climbers. This growth-form distribution, shown in Fig. 2, indicates that roadside and road-divider vegetation in RCC is overwhelmingly composed of arboreal and shrubby taxa. Taxonomic grouping further revealed a marked predominance of dicotyledons, which accounted for 141 species (87.6%), followed by monocotyledons with 17 species(10.6%) and gymnospermswith 3 species(1.9%). The relative contribution of these major taxonomic groups is presented in Fig. 3. Collectively, these results indicate that the roadside flora of RCC is characterized by strong dominance of woody dicotyledonous taxa, consistent with plantation preferences in urban transport corridors.

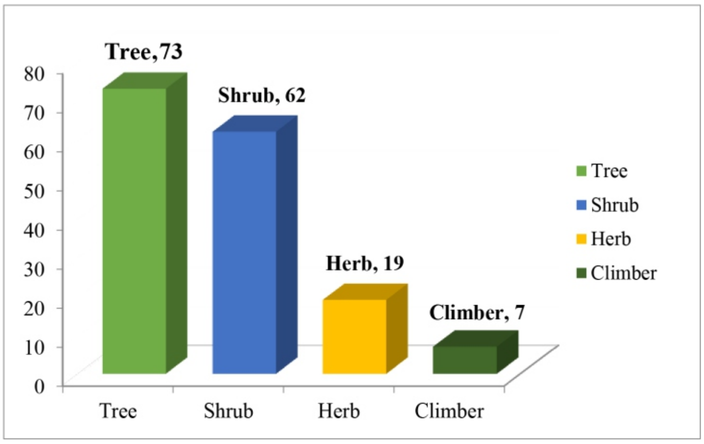

Fig. 2: Growth-form composition of plant species recorded from roadside and road-divider habitats in Rajshahi City Corporation, Bangladesh. Trees and shrubs constituted the dominant growth forms, followed by herbs and climbers.

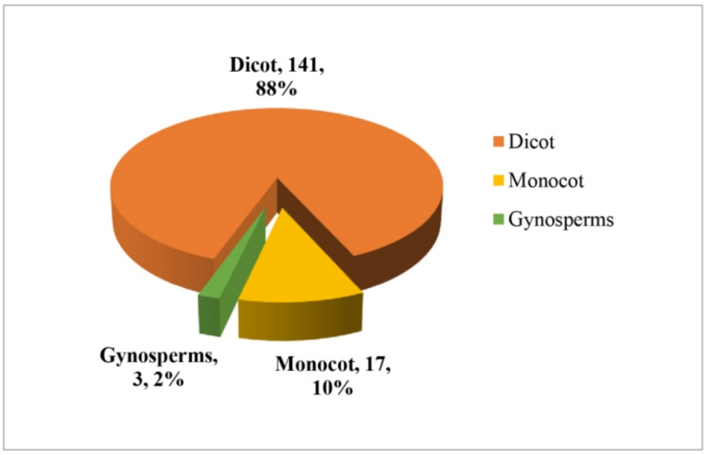

Fig. 3: Taxonomic composition of plant species recorded from roadside and road-divider habitats in Rajshahi City Corporation, Bangladesh.Dicotyledons constituted the dominant group, followed by monocotyledons and gymnosperms.

Abundance pattern of the recorded species

The abundance pattern of the recorded flora is presented in Fig. 4, whereas species-wise abundance categories are provided in Table 1. Among the 161 species recorded, 94 species (58%) were categorized as common, 13 species (8%) as very common, 48 species (30%) as rare, and 6 species (4%) as very rare. The common category constituted the largest proportion of the recorded flora, whereas the very common and very rare categories were represented by comparatively few species. This abundance pattern indicates that the vegetation assemblage consisted of a recurrent group of frequently encountered species together with a substantial proportion of less represented taxa. Thus, although the study area supported relatively high species richness, species distribution across sites was uneven, and many taxa occurred only sparsely within the surveyed urban landscape.

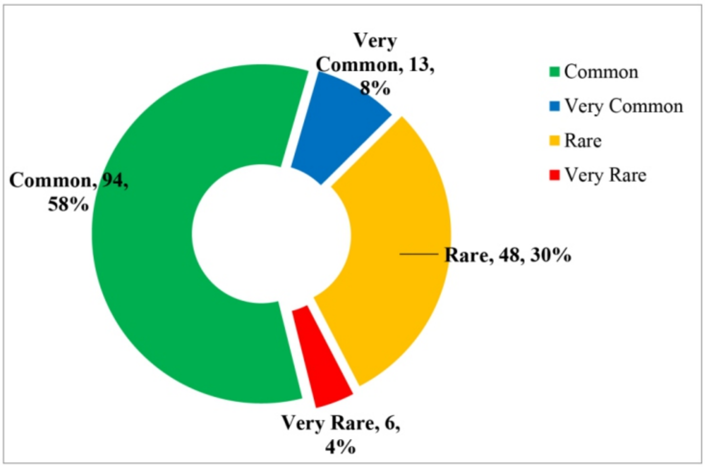

Fig. 4: Abundance categories of the recorded plant species in the study area, showing that most species were common (58%), followed by rare (30%), very common (8%), and very rare (4%).

Functional use categories of the recorded plant species

The functional use categories of the recorded flora are presented in Fig. 5, with species-level details provided in Table 1. Ornamental species constituted the dominant use category (104 species), followed by medicinal species (44 species) and timber-related species (19 species). By comparison, comparatively few taxa were assigned to food, edible, ecological, landscaping, and dye/cosmetic categories.

The predominance of ornamental taxa indicates that roadside and divider plantations in the study area were structured mainly around aesthetic and landscape-oriented objectives. Representative ornamental species included *Allamanda cathartica*, *Nerium oleander*, *Ixora coccinea*, *Bougainvillea spectabilis*, *Hibiscus rosa-sinensis*, *Canna indica*, and *Mussaendaerythrophylla*, whereas medicinal taxa such as *Justicia adhatoda*, *Alstoniascholaris*, *Azadirachta indica*, *Terminalia arjuna*, and *Moringa oleifera* were present in lower proportions (Table 1). Overall, the functional composition of the flora reflects the dominant influence of ornamental planting preferences in the urban green infrastructure of the study area.

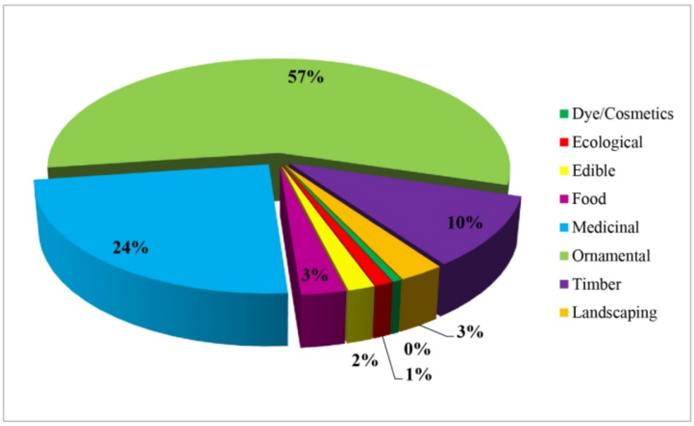

Fig. 5: Functional use categories of recorded plant species in the study area. Ornamental species constituted the largest proportion (57%), followed by medicinal (24%) and timber (10%), while food, edible, ecological, landscaping, and dye/cosmetic categories were represented by comparatively smaller proportions.

Dominance pattern of plant species based on phytosociological attributes

The dominant taxa in the roadside and road-divider vegetation, as assessed through phytosociological parameters, are presented in Table 2. According to importance value index (IVI), *Nerium oleander* ranked highest (28.77), followed by *Canna indica* (27.79), *Mussaendaerythrophylla* (27.51), *Helianthus annuus* (26.68), *Ixora coccinea* (24.60), and *Polyalthialongifolia* (20.33). Additional species with notable dominance values included *Allamanda cathartica* (17.94) and *Tabernaemontanadivaricata* (16.90).

The elevated values of relative density, relative frequency, and relative abundance recorded for these taxa further confirm their strong numerical and spatial prominence within the study area. Collectively, these results indicate that the structural dominance of the roadside plantation system was disproportionately concentrated in a relatively small subset of taxa, notwithstanding the broader floristic richness documented across the study area. The predominance of ornamental species among the highest-ranking taxa further suggests that managed planting preference played a major role in shaping the phytosociological composition of the surveyed urban vegetation.

Table 2: Dominant plant species along roadsides and road dividers in Rajshahi City Corporation based on relative density, relative frequency, relative abundance, and importance value index (IVI).

Scientific Name	Common Name	Count	Relative Density (RD)	RelativeFrequency (RF)	RelativeAbundance (RA)	IVI
Allamanda cathartica L.	Allamanda	1500	6.64	5.50	5.80	17.94
Nerium oleander L.	Karabi	2500	11.07	9.20	8.50	28.77
Helianthus annuus	Surjomukhi	2300	10.18	8.50	8.00	26.68
Ixora coccinea	Ronggon	2100	9.30	7.80	7.50	24.60
Polyalthia longifolia	Debdaru	1700	7.53	6.30	6.50	20.33
Mimusopselengi	Bokul	200	0.89	1.50	1.20	3.59
Bougainvillea spectabilis	Baganbilas	430	1.90	2.20	2.50	6.60
Hibiscus rosa-sinensis	Joba	600	2.66	3.00	3.50	9.16
Tabernaemontanadivaricata	Bamontogor	1400	6.20	5.20	5.50	16.90
Bauhinia variegata	Kanchon	700	3.10	3.50	3.80	10.40
Tecoma stans	Hoimonti	2100	9.30	7.80	7.50	24.60
Canna indica	Kolaboti	2200	11.29	9.50	9.00	27.79
Caesalpinia pulcherrima	Radhachura	500	2.21	2.50	2.80	7.51
Lagerstroemia speciosa	Jarul	750	3.32	3.80	4.00	11.12
Codiaeum variegatum	Patabahar	330	1.46	1.80	2.00	5.26
Syzygiumjambos	Golapjam	70	0.31	0.80	0.50	1.61
Thuja occidentalis	Thuja	400	1.77	2.00	2.30	6.07
Mussaendaerythrophylla	Musanda	2350	10.41	8.80	8.30	27.51
Durantaerecta	Kata mehedi	300	1.33	1.50	1.80	4.63
Moringa oleifera	Sojina	350	1.55	1.80	2.00	5.35
Callistemon citrinus	Bottle brush	50	0.22	0.50	0.30	1.02
Total		22580	100	100	100	300.0

Spatial variation in species diversity across sampled sites

Spatial variation in plant species diversity among the surveyed road segments is shown in **Table 3**, which presents species richness, total abundance, and the Shannon–Wiener diversity index (H')for each site. The highest diversity was recorded at C&B Road–Court Area Road (H' = 2.98), followed by Rajshahi University–Talaimari (H' = 2.81) and Talaimari–Shaheb Bazar Main Road (H' = 2.65). The relatively higher diversity values at these sites corresponded with greater species richness and higher numbers of individuals, suggesting assemblages with broader taxonomic representation and comparatively greater evenness.

By contrast, the lowest diversity values were recorded at New Market–Rail Gate (H' = 1.08), Octroi More–Koroitola More (H' = 1.23), and Padma River Embankment (H' = 1.34). These lower values indicate assemblages with reduced richness and stronger concentration of individuals within a restricted number of taxa. Several sites showed intermediate diversity, including Rajshahi College–C&B Road (H' = 2.42), Court Area Road–Kashiadanga Bypass (H' = 2.15), and Kharkhori–Biman Bandar Road (H' = 1.98). Collectively, the observed range of H' values (1.08–2.98) demonstrates substantial spatial heterogeneity in the diversity structure of roadside and road-divider vegetation across the study area.

Table 3: Site-wise variation in species richness, individual abundance, and Shannon–Wienerdiversity index (H') of roadside and road-divider vegetation in Rajshahi City Corporation.

Site name	Number of species	Number of Individuals	Shannon–Wiener Diversity Index
C&B Road – Court Area Road	42	612	2.98
Rajshahi University – Talaimari	35	415	2.81
Talaimari– Shaheb Bazar Main Road	28	340	2.65
Rajshahi College – C&B Road	22	198	2.42
Court Area Road – Kashiadanga Bypass	18	254	2.15
Kashiadanga Bypass – Rajshahi Medical	15	110	1.95
Bornali– Rail Gate	12	85	1.82
Rail Station – Talaimari Traffic point	10	72	1.74
Sapura – Shalbagan Road	8	55	1.58
Stadium – Aam Chattar	9	63	1.62
Aam Chattar– Airport	11	75	1.81
Uposhahar Main Road – Sector Dividers	7	55	1.43
Vodra Morr – Budhpara Flyover Road	9	62	1.61
Padma River Embankment (Paved Road side)	6	53	1.34
Terokhadia - Cantonment Road	12	83	1.78
University Main Gate - Katakhali	8	64	1.65
Meherchandi - Binodpur	9	63	1.62
Khakhori – Biman Bandar Road	15	115	1.98
Octroy More – Koroitola More	5	45	1.23
New Market – Rail Gate	4	38	1.08

Discussion

The present study demonstrates that roadside and road-divider habitats in Rajshahi City Corporation support substantial floristic richness, with 161 species representing 114 genera and 56 families. This finding indicates that these linear urban green spaces function as important components of the city's green infrastructure rather than merely as ornamental strips. However, the recorded richness was accompanied by clear unevenness in taxonomic representation, growth-form composition, functional use, dominance structure, and site-level diversity. Thus, the roadside flora of Rajshahi may be interpreted as a relatively rich but management-shaped urban assemblage, in which observed diversity patterns are strongly influenced by plantation choice, site conditions, and maintenance practices. This pattern is consistent with broader urban ecological evidence showing that managed roadside and urban green spaces can support considerable plant richness, while their composition often remains strongly shaped by human-mediated planting preferences and management regimes[41,42].

The concentration of species within a limited number of families, particularly Fabaceae, Euphorbiaceae, Arecaceae, and Malvaceae, indicates that the roadside flora was taxonomically uneven despite its relatively high overall richness. This pattern is ecologically meaningful because urban roadside habitats are typically exposed to recurrent disturbance, heat stress, dust deposition, restricted rooting space, and regular maintenance, all of which can favor hardy, stress-tolerant, and easily maintained taxa.

Similar family-level dominance has been reported in managed urban floras, where a small number of species-rich families often contribute disproportionately to total richness due to repeated use of ornamental, shade-providing, or disturbance-tolerant plants [43,44]. Therefore, the family composition observed in Rajshahi likely reflects the combined influence of environmental filtering, nursery availability, and municipal planting preference rather than purely spontaneous species assembly[45,46].

The predominance of trees and shrubs further indicates that the vegetation structure is organized primarily around perennial woody taxa. Such a structure is typical of managed roadside systems because woody species provide long-term canopy cover, visual continuity, shade, and relatively stable landscape performance. This pattern is also functionally relevant, as woody vegetation can contribute to microclimatic moderation, particulate interception, and urban landscape stability. Comparable dominance of woody growth forms has been observed in many urban roadside and avenue plantations, where trees and shrubs are commonly prioritized for their durability, aesthetic value, and environmental buffering capacity. Nevertheless, the comparatively low representation of herbs and climbers in the present study suggests reduced structural heterogeneity in lower vegetation strata. Increasing life-form diversity through carefully selected herbs, ground covers, and climbers could therefore enhance habitat complexity and improve the ecological value of these linear green spaces[29,47,48].

The strong predominance of dicotyledonous taxa is also consistent with the plantation character of the study area.

Many commonly used avenue trees, flowering shrubs, and ornamental species belong to dicotyledonous groups, which explains their numerical dominance in the recorded flora. However, this pattern also suggests that the vegetation system is less taxonomically balanced than total species richness alone might imply. From an ecological perspective, concentration within similar taxonomic groups may reduce resilience by increasing dependence on a narrower set of structural and functional traits [43,49]. This interpretation agrees with urban vegetation studies indicating that high species richness does not necessarily ensure ecological balance when richness is concentrated within a limited range of growth forms or taxonomic groups. Therefore, future roadside planting should consider not only species number but also taxonomic breadth and functional complementarity [43,4951].

The abundance structure of the flora indicates the coexistence of a recurrent core of frequently encountered taxa and a substantial number of less represented species. Although many taxa were classified as common, a considerable proportion remained rare or very rare, suggesting that species were not uniformly distributed across the surveyed landscape. This pattern is characteristic of designed urban vegetation systems in which a limited number of preferred species are repeatedly planted across multiple sites, while many other taxa occur only locally or at lower abundance [17,43]. Similar uneven abundance patterns have been reported in managed urban green spaces, where repeated plantation of a limited species pool can create high city-level richness but relatively uneven site-level representation [48,52,53]. Consequently, the relatively high richness recorded in Rajshahi should be interpreted alongside abundance distribution and site-wise recurrence [43,53].

The functional use profile clearly shows that ornamental considerations were the principal driver of species selection in the study area. Ornamental taxa constituted the dominant use category, whereas medicinal, timber-related, food, ecological, and other functional categories were represented in lower proportions. This indicates that roadside and road-divider plantations in Rajshahi have been structured mainly around aesthetic and landscape-oriented objectives. The predominance of ornamental species is widely recognized in urban roadside plantations, where visual quality, flowering display, and streetscape beautification often receive greater priority than ecological multifunctionality. While such planting is understandable in highly visible public corridors, it may limit the broader ecological role of roadside vegetation if habitat-supporting, native, and functionally complementary species are underrepresented. Thus, future plantation planning should aim to balance aesthetic value with ecological performance [8,9,17,29,49,54].

The phytosociological analysis reinforces this interpretation by showing that dominance was concentrated in a small subset of taxa, particularly *Nerium oleander*, *Canna indica*, *Mussaendaerythrophylla*, *Helianthus annuus*, *Ixora coccinea*, and *Polyalthia longifolia*. Their high IVI values and associated relative density, relative frequency, and relative abundance indicate strong numerical and spatial prominence within the roadside vegetation matrix[55,56]. Similar dominance patterns, in which a few repeatedly planted species account for high structural importance, have been documented in other managed urban vegetation systems and are commonly interpreted as evidence of planting preference and compositional homogenization [17,47,48].

Although reliance on a limited group of hardy ornamental taxa may simplify maintenance and ensure predictable performance under urban stress, it may also reduce compositional distinctiveness among road segments. Broader taxonomic and functional diversification would therefore be beneficial for improving long-term ecological resilience [42,43,51,57].

The marked spatial variation in Shannon–Wiener diversity among road segments further demonstrates that roadside vegetation is not organized uniformly across Rajshahi City Corporation. Sites with higher diversity, such as C&B Road–Court Area Road and Rajshahi University–Talaimari, likely reflect broader species representation and comparatively greater evenness. In contrast, lower-diversity sites such as New Market–Rail Gate and Octroi More–Koroitola More appear to be characterized by reduced richness and stronger dominance by fewer taxa. Spatial heterogeneity in roadside vegetation diversity has also been reported in other urban systems, where differences in road width, median size, land-use intensity, disturbance pressure, and maintenance regimes influence local plant assemblages [29,45,46]. This suggests that a uniform city-wide plantation model may not be sufficient; instead, site-specific planting strategies should be developed according to corridor width, soil depth, traffic pressure, and management capacity. Overall, the findings suggest that roadside and road-divider vegetation in Rajshahi City Corporation represents a floristically rich but compositionally selective urban flora. The current plantation system has clear value for urban greening, landscape enhancement, and public visual amenity, but its long-term ecological contribution could be strengthened through greater diversification in species choice, growth-form structure, and functional composition. This interpretation is consistent with broader urban ecological research emphasizing that sustainable green infrastructure should integrate biodiversity conservation, ecological function, and aesthetic quality rather than prioritizing beautification alone. Therefore, the present study provides an ecological basis for shifting from predominantly ornamental roadside planting toward a more balanced model of urban greening that incorporates native species, habitat-supporting taxa, structural heterogeneity, and site-sensitive plantation design.

Conclusions

This study provides a systematic baseline assessment of roadside and road-divider vegetation in Rajshahi City Corporation by documenting floristic composition, growth-form structure, abundance pattern, functional uses, phytosociological dominance, and site-wise diversity. The recorded flora showed considerable species richness, comprising 161 species under 114 genera and 56 families, but its composition was strongly shaped by woody, dicotyledonous, and ornamental taxa. Dominance was concentrated in a limited number of widely planted ornamental species, while Shannon–Wiener diversity varied markedly among road segments, indicating spatial heterogeneity in the urban plantation system. These findings suggest that roadside vegetation in Rajshahi contributes meaningfully to urban green infrastructure, but its ecological value and resilience could be strengthened through greater taxonomic, structural, and functional diversification. Future plantation planning should therefore prioritize site-specific species selection, increased use of native and habitat-supporting taxa, and a balanced integration of aesthetic, ecological, and biodiversity-oriented objectives.

Data availability statement
All data generated or analyzed during this study are included in this published article and its supplementary information files.

Ethics statement
This study did not involve human participants or animals. Therefore, formal ethical approval was not required. Field observations were conducted only for plant documentation within roadside and road-divider habitats.

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Declaration of Competing Interests
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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CRediT authorship contribution statement
Md. Masud Rana: Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. Tofael Ahmed: Writing – review and editing, Validation, Software, Methodology, Investigation, Formal analysis, Visualization, Data curation, Conceptualization. Md. Omar Faruq: Writing – review and editing, Supervision, Methodology, Investigation. Rony Rani: Writing – review and editing, Supervision, Formal analysis, Methodology, Investigation, Data curation, Conceptualization.

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