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The Biology of Invasive Native Plant as an Ex-situ Collection: A Case Study of *Epipremnum pinnatum* (L.) Engl. (Araceae) in Bogor Botanical Garden, Indonesia

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ABSTRACT

The Bogor Botanical Garden (BBG) is a pivotal center for plant research and conservation, boasting a diverse collection of over 12,000 individual plants spanning various species. However, among the plant collections at BBG, some of them have the potential to be invasive. Therefore, this study aimed to uncover the plant collections at BBG with invasive potential and analyze the distribution of one of the most dominant collections, *Epipremnum pinnatum* (L.) Engl. The method employed in this research involved a literature review to identify which plant collections have invasive potential and a vegetation analysis on the distribution of *E. pinnatum* within BBG. Additionally, ANOVA analysis and regression models were employed to explore the relationship between environmental factors and *E. pinnatum* abundance. Results revealed that BBG hosted 78 potentially invasive plant species, with *E. pinnatum* comprising 28 individuals. Spatial analysis indicates a clustered distribution of *E. pinnatum*, influenced by seed dispersal mechanisms, environmental factors, and biotic interactions. Correlation analysis links soil pH, soil moisture, and canopy cover to *E. pinnatum* distribution. Canopy cover demonstrates a significant positive correlation with *E. pinnatum* abundance, suggesting its importance in providing favorable microclimates for growth. Regression analysis further supports canopy cover as a predictor of *E. pinnatum* presence. However, while a strong statistical association was observed, causal relationships require further investigation. This study underscores the complexity of ecological dynamics in BBG and emphasizes the need for comprehensive research to define underlying mechanisms driving plant distributions and interactions.

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INTRODUCTION

The Bogor Botanical Garden (BBG) is a pivotal institution for plant research, ex-situ plant conservation, environmental education, and the provision of environmental services and tourism (https://www.bgci.org/about/botanic-gardens-and-plant-conservation/; Presidential Regulation No. 93 of 2011; Chen and Sun., 2018). The central role of Botanical gardens is to support global biodiversity conservation and preservation, particularly for endangered species (Widyatmoko and Risna., 2017). BBG houses over 12,000 individual plants, encompassing more than 3,500 species from over 1,200 genera (Ariati et al., 2019).

BBG is a plant research and conservation in Indonesia (Sukarya et al., 2017). Numerous studies have utilized these collections, such as flowering phenology (Yudaputra et al., 2016), tree health monitoring (Zulkarnaen et al., 2021; Wardani et al., 2022; Indresputra et al., 2023), seed germination (Latifah et al., 2020), and entomology (Mubin et al., 2022). The extensive plant collections of BBG present significant research potential from various perspectives. This manuscript focuses on *Epipremnum pinnatum* (L.) Engl., a BBG collection with potential invasive tendencies.

Epipremnum pinnatum, a member of the Araceae family, is an herbaceous plant characterized by its climbing roots, capable of growing up to 6-8 meters long. Its flexible and cylindrical stems, reaching up to 3 cm in diameter, exude watery sap and are covered by papery bark. The leaves are green, not variegated, arranged alternately, with simple, upward-pointing juvenile leaves. In contrast, the adult leaves are pinnately dissected, reaching sizes of up to 50 × 30 cm and hanging downward. In its natural habitat, *E. pinnatum* climbs trees and spreads through disturbed areas and roadsides, often outcompeting native vegetation (Rojas-Sandoval & Acevedo-Rodríguez, 2024). Despite its invasive tendencies, *E. pinnatum* is widely valued as an ornamental climber in tropical regions due to its adaptability and availability (Windadri et al., 2006; Boyce & Tropicals, 2004; Yuzammi, 2018; Nabila et al., 2021).

The genus *Epipremnum* comprises approximately 15 species, predominantly found in tropical and subtropical regions of Asia (POWO, 2024). *E. pinnatum* is native to regions ranging from India and China to Southeast Asia, Australia, and the Pacific Islands, with additional introductions in Central and South America, Florida, South Africa, Tanzania, Hawaii, and the West Indies (Wagner et al., 1999; Acevedo-Rodríguez & Strong, 2005; Wunderlin & Hansen, 2008; POWO, 2024). Its rapid growth and ease of propagation have facilitated its proliferation, especially in tropical forests, where it can quickly climb and overtake native vegetation, depriving them of sunlight and space (ISSG, 2012).

Epipremnum pinnatum is well-represented in BBG collections, with 28 living specimens maintained. These specimens originate from various Indonesian islands, including Sumatra, Java, Borneo, and Sulawesi. The earliest recorded specimen was from 1894, brought from Sulawesi by Koorders. Over the years, at least 34 specimens have been added from different islands, some through propagation efforts or spontaneous occurrences within the garden. This collection underscores the species' adaptability and its long history of successful cultivation in ex-situ environments.

This study aimed to explore the potential of BBG collections, focusing on the biological aspects and distribution patterns of *E. pinnatum* in the dynamic landscape of BBG as an ex-situ conservation area. Insights on the characteristics, ecology, and invasive potential of *E. pinnatum* in the BBG environment are expected to enhance our understanding of this species and inform the management and preservation of BBG collections. This research is also relevant to broader contexts of biodiversity conservation and management.

MATERIALS AND METHODS

Study Area

The research site located in the Bogor Botanical Garden (BBG), West Java, Indonesia, with the coordinates of 6°35'33"–6°36'13" S and 106°47'40"–106°48'18" E (Figure 1). The total area of the research location was 87 hectares, with an elevation of approximately 257 meters above sea level. The average annual rainfall ranged between 4,000–5,000 mm, and the average of air temperature was 24°C, with a range of 20–33°C (Ariati & Widyatmoko, 2019).

Materials

This study utilized the necessary materials and tools to explore the potential distribution of *E. pinnatum* in BBG. The primary material was *E. pinnatum*, which grew in various locations in BBG. Regarding the taxonomy and distribution of *E. pinnatum*, the plant is native to the Malay Archipelago and the Pacific Islands but is currently distributed across the Oriental and Australasian Regions (Fartyal et al., 2013). The field observation tools include a map of BBG, GPS for navigation, Clinometer (slope angle), Compass (direction), Thermo-hygrometer (humidity), soil pH measuring tools, a camera, and writing/field notes tools for recording observation data.

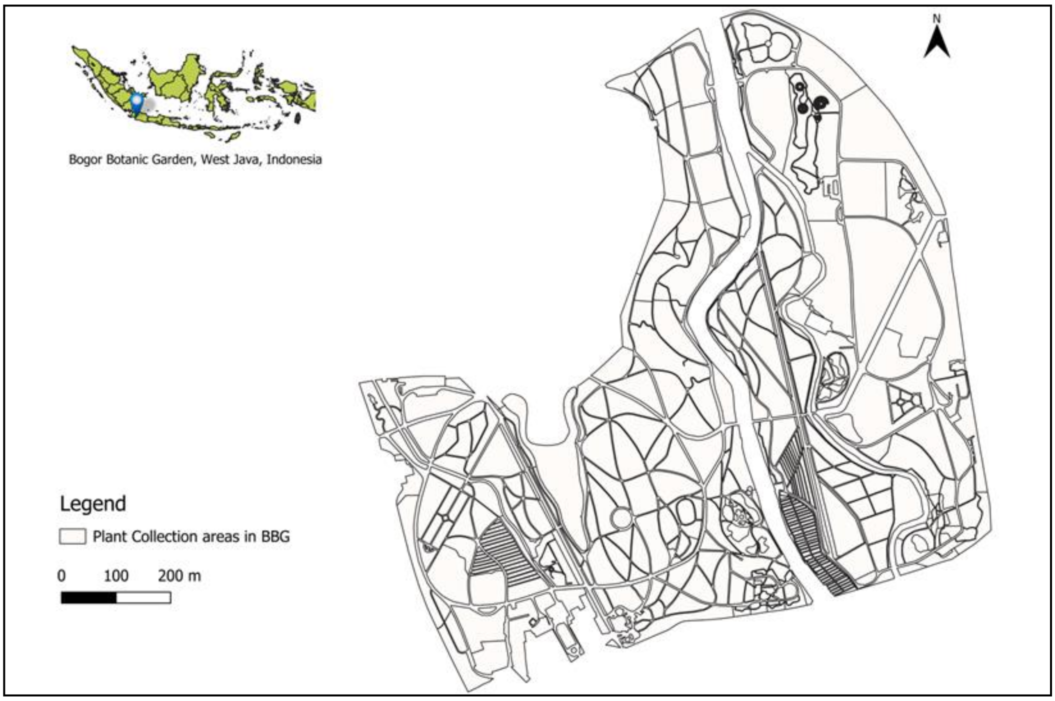

Figure 1. Research Map in Bogor Botanical Garden Area

Research Design

Validation of BBG Collection Potentially as Invasive Plants

The data on the BBG plant collection used in this study refers to the latest BBG data outlined in the BBG catalog by Ariati et al. (2019). To ensure the validity of the potentially invasive collection data, a validation stage was carried out using the global invasive plant database available through http://www.iucngisd.org/gisd/. This validation process was done to compare and check the compatibility between the plant collection data in BBG and the data in the global invasive plant database. The aim was to identify whether any plants recorded in the BBG collection are also listed as invasive plants in the global database.

Distribution of E. pinnatum Collection in BBG

The method used to determine the distribution of the *E. pinnatum* collection was a comprehensive systematic plot sampling method measuring 1x1 square meters with a distance of 100 m between plots (Ellenberg & Mueller-Dombois, 2016). A total of 90 plots were distributed within BBG. At each plot, the number of individual *E. pinnatum* plants was recorded. In addition, environmental data were also carefully recorded. The environmental data collected in this study included canopy cover, soil pH, and soil moisture levels. Canopy cover assessment was measured using the HabitApp application (Sunchiang et al., 2020). Soil pH reflected the acidity level in each plot, while soil moisture level measured the water content in the soil. Other environmental factors were considered homogeneous because the research was conducted in a relatively consistent area of the BBG, characterized by similar conditions in terms of these factors.

Data Analysis

The analysis began with examining vegetation to assess the potential invasiveness of plant collections. Additionally, various vegetation analysis methods were employed to understand the distribution of *E. pinnatum.* These methods assessed distribution patterns (Morisita, 1962) and examined structural attributes and abundance of *E. pinnatum* growth (Ellenberg & Mueller-Dombois, 2016). Furthermore, an analysis of variance (ANOVA) was conducted to discern potential variations in vegetation characteristics across different habitat types. Subsequently, regression analysis was employed to explore the correlation between environmental factors and the presence of *E. pinnatum*, facilitated by SPSS Software. This comprehensive approach provided valuable insights into the ecological determinants shaping the distribution of *E. pinnatum* and enhanced our understanding of habitat suitability.

$$Id = n\frac{\sum X^2 - \sum x}{(\sum X)^2 - \sum x}$$

Note:
Id = Morisita dispersion index
n = number of sampling units
∑x = total number of individuals of a species in a community
∑x² = sum of squares of the total number of individuals of a species in a community

The criteria for distribution patterns are categorized as follows:
Id < 1 = uniform distribution pattern
Id = 1 = random distribution pattern
Id > 1 = clumped distribution pattern

RESULTS AND DISCUSSION

Identifying Potential Invasive Plants Collection

The study revealed that the Bogor Botanical Garden (BBG) hosted 78 potentially invasive species out of a total of 469 globally recognized invasive plant species (Figure 2). This finding underscores a significant challenge in managing the plant collections at BBG, emphasizing the need for careful monitoring and management to prevent the potential spread of these invasive species into broader ecosystems.

Among these 78 potentially invasive species, a total of 294 individual plants were identified within BBG (See detail in Appendix 1). Among these species, *Epipremnum pinnatum* dominates with 28 individuals, followed by *Angiopteris evecta* (G.Forst.) Hoffm. (21 individuals), *Litsea glutinosa* (Lour.) C.B.Rob. (18 individuals), and *Alpinia zerumbet* (Pers.) B.L.Burtt & R.M.Sm. (12 individuals). Furthermore, an analysis of potentially invasive plant families identified several dominant families, such as Araceae with 32 individuals, Lauraceae with 20 individuals, Marattiaceae with 20 individuals, Zingiberaceae with 18 individuals, Bignoniaceae with 17 individuals, and Arecaceae with 15 individuals.

Based on the data, *E. pinnatum* is the most dominant species with 28 individuals (Figure 3). This species exhibits rapid growth and can easily spread through vegetative propagation (Asharo et al., 2022). Asharo et al. (2022) also explained that *E. pinnatum* can be utilized as an ornamental plant and medicine. However, the growth of *E. pinnatum*, which often attaches to tree trunks, will negatively impact on decay due to the microclimate created over a long period (Helmanto et al., 2018; Martiansyah et al., 2022).

Therefore, through careful monitoring and control measures, the potential risk of further spread and adverse impacts on native ecosystems can be suppressed or reduced (Purnomo et al., 2020; Darmayani et al., 2022). The study of the distribution of *E. pinnatum*, which has the highest number of individuals among all potentially invasive, becomes an appropriate representative. This study aimed to determine the extent of the spread of this species within BBG to support conservation efforts and maintain sustainability.

Distribution of *Epipremnum pinnatum* in Bogor Botanical Garden

The inventory results of the distribution of *E. pinnatum* indicate the presence of this species in 46 plots out of a total of 90 plots. The total number of individuals was 2936. The majority of *E. pinnatum* distribution was found above ground (Figure 4). The distribution analysis revealed that the Morisita index value was 1.82. This value indicates that the distribution of *E. pinnatum* is clustered.

The clustered distribution of *E. pinnatum* can be attributed to various factors, including seed dispersal mechanisms, environmental conditions, and biotic interactions (Latifah et al., 2020). For instance, this species may exhibit a clustered distribution if its seeds are dispersed by animals that deposit them in specific areas or if the plant employs vegetative dispersal mechanisms, such as forming bulbs akin to *Dioscorea* species. Additionally, environmental factors, such as soil types or microhabitats, may influence the spatial arrangement of *E. pinnatum* individuals (Soberón & Nakamura, 2009). Furthermore, biotic interactions, particularly competition with other plant species, could also contribute to the clustering phenomenon, as individuals may grow close to access limited resources (Wisz et al., 2012).

The Influence of Environment on the Distribution of *Epipremnum pinnatum*

Correlation analysis indicates that soil pH and soil rH have a weak negative correlation with the presence of *E. pinnatum*, which grows better in soil with a low pH of about 4.5 to 5.5. Gentili et al. (2023) explained that soil pH affects nutrient availability, with extreme pH levels limiting certain

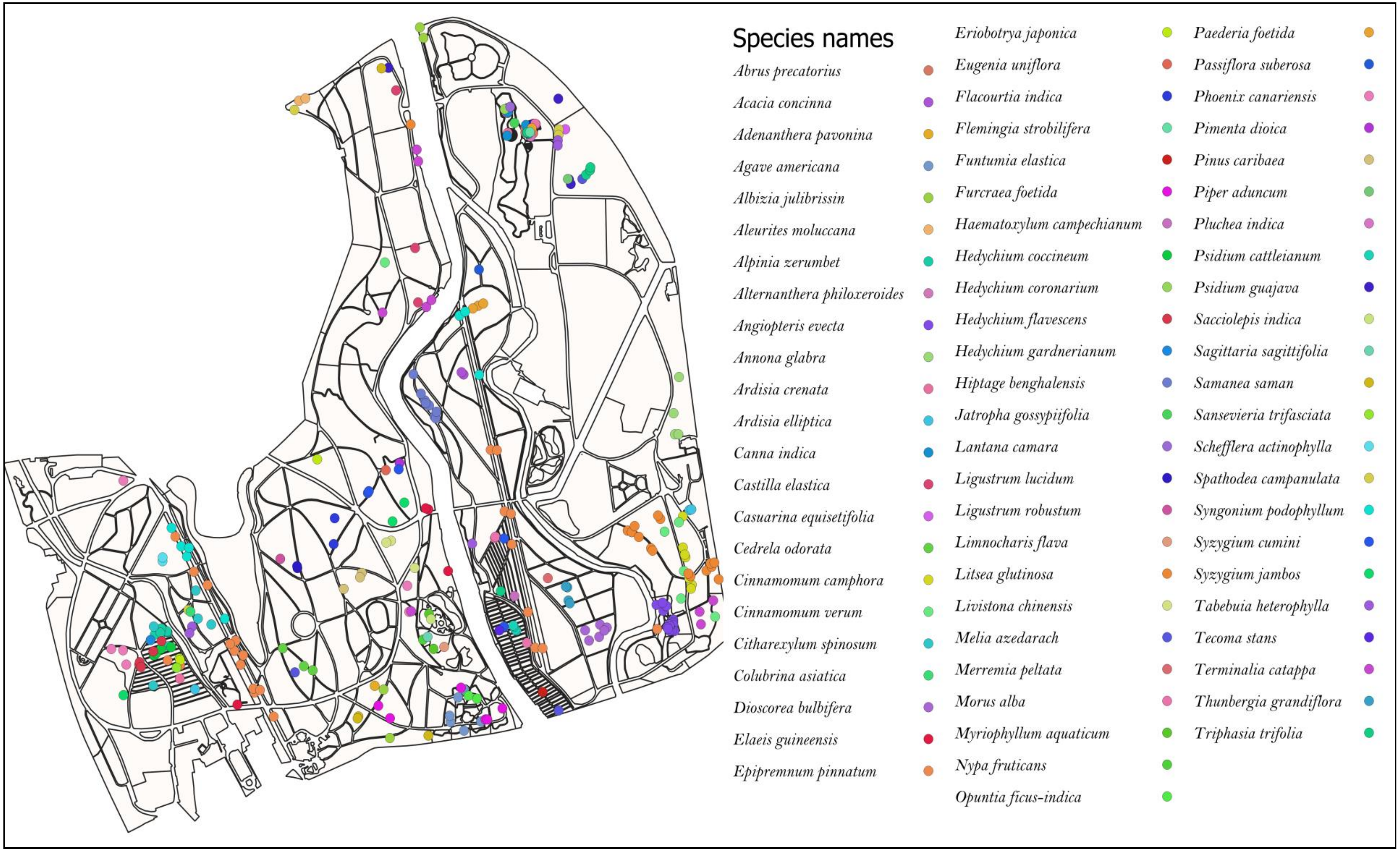

Figure 2. Distribution of potentially invasive plant collections in Bogor Botanical Gardens

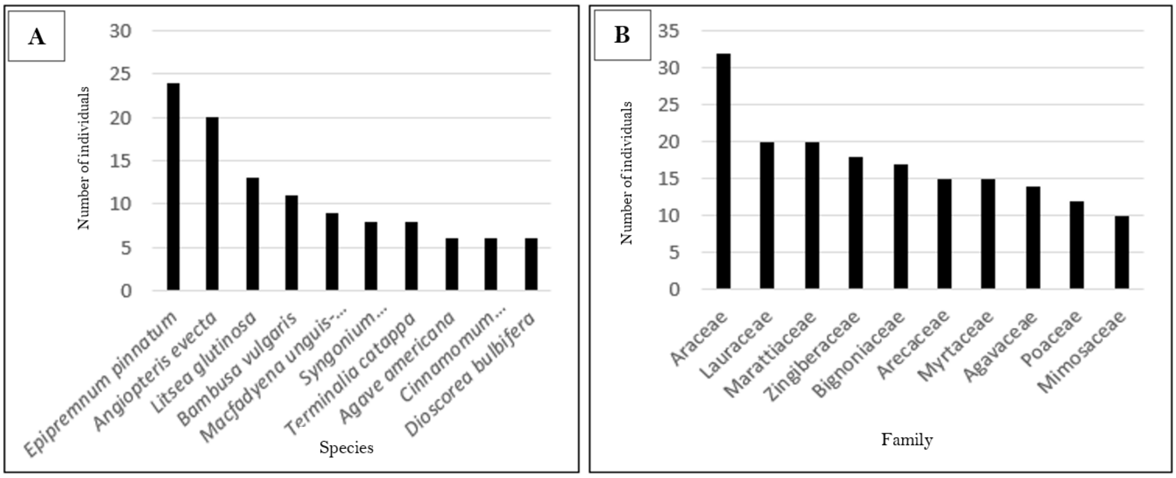

Figure 3. A. The highest number of potentially invasive individuals, B. Distribution of potentially invasive collections at the family level

Figure 4. The growth phase of *Epipremnum pinnatum.* (A). seedlings stage; (B). seedlings start to climb the host tree; (C). Juvenile stage; (D). The adult stage is characterized by leaves that are divided. All images were taken at BBG

Table 1. Summary of ANOVA Analysis for Number of Individuals by Canopy Cover

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25026.466	1	25026.466	6.221	.015[b]
	Residual	329882.487	82	4022.957		
	Total	354908.952	83			

a. Dependent Variable: Number of Individuals

b. Predictors: (Constant), Canopy cover

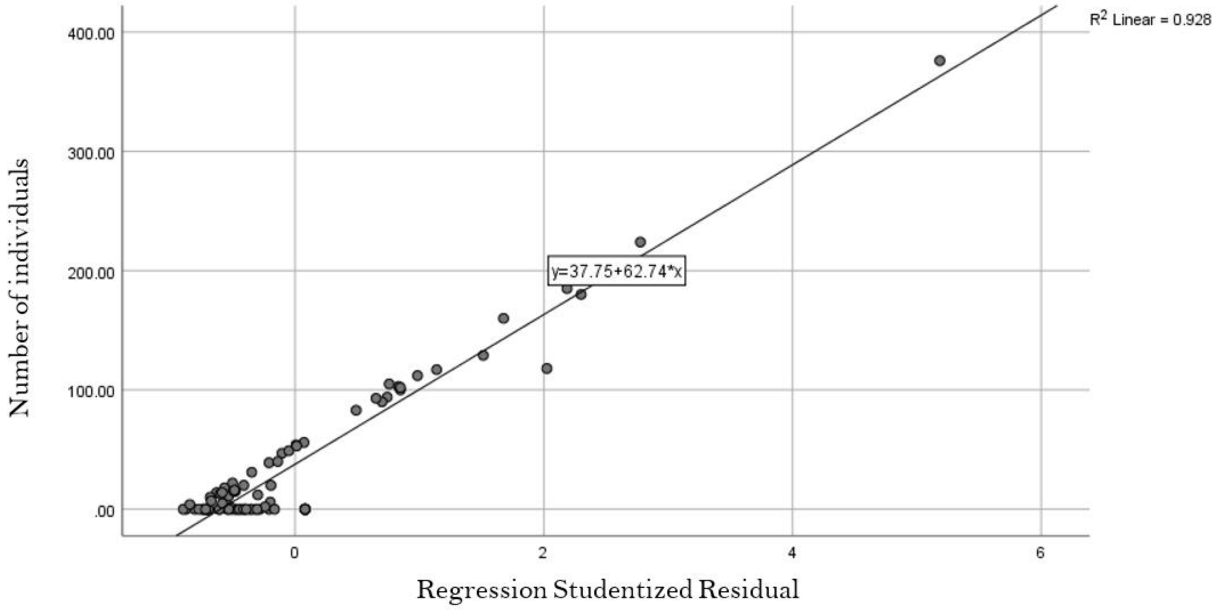

Figure 5. Scatter plot of correlation between canopy cover with number of *Epipremnum pinnatum*

(Nopriani et al., 2023). Additionally, *E. pinnatum* prefers low rH (oxygen-poor) soil conditions, which support the activity of beneficial anaerobic bacteria (Martorell & Martínez-López, 2013). Variations in soil pH can significantly affect the distribution of plant species by influencing nutrient availability (Cottingham et al., 2005).

The positive correlation between canopy cover and the presence of *E. pinnatum* in the research plot indicates that as canopy cover increases, the abundance of *E. pinnatum* plants also increases (Staelens et al., 2006). This relationship underscores the significant role of canopy cover in shaping the distribution and density of plant species within an ecosystem. Canopy cover is crucial in creating a favorable microclimate for plant growth by regulating temperature and humidity levels (Pordel et al., 2018). Furthermore, a diverse plant community within the canopy can provide ecological benefits that support the proliferation of specific plant species like *E. pinnatum* (Irving & Connell, 2006).

Furthermore, The ANOVA analysis of the regression model showed statistical significance with a p-value less than 0.05, indicating that canopy cover plays a role in explaining the variation in the number of individuals (Table 1). The model also suggests that at least one independent variable (soil pH, soil rH, or canopy cover) affects the number of plant species. These environmental factors can be important predictors in determining the presence and diversity of plant species in the research area.

In this study, we examine the correlation between canopy cover and the number of individuals of *E. pinnatum.* The scatter plot revealed a strong positive relationship, as indicated by an R^2 value of 0.928 (Figure 5). This R^2 value, derived from regression analysis, indicates that approximately 92.8% of the variance in the number of *E. pinnatum* individuals can be explained by changes in the regression-studentized residual. This high R^2 value suggests that canopy cover is a significant predictor of the presence and abundance of *E. pinnatum*, indicating that specific microenvironmental conditions created by the canopy, such as moderated temperature, increased humidity, and reduced soil erosion, are particularly conducive to the growth of this species. Thus, Canopy cover plays a crucial role in providing a stable habitat and optimal growing conditions essential for the proliferation of *E. pinnatum* (Freya et al., 2016).

According to the results, a significant correlation was identified between canopy cover and the presence of *E. pinnatum*. However, due to the observational nature of this study, the established association is purely statistical and cannot definitively demonstrate causality. The potential influence of external factors, such as climatic conditions and interspecific plant interactions, on the plant community composition and diversity within the ecosystem remains unexplored. Therefore, to comprehensively understand the complex ecological dynamics that occur, further research incorporating a more extensive array of variables is necessary.

Considering its rapid growth and ability to spread through vegetative propagation, *E. pinnatum* poses a notable threat despite its ornamental and medicinal uses. However, its attachment to tree trunks could accelerate decay over time, requiring proactive measures to mitigate its invasive potential. The spatial distribution of *E. pinnatum* within BBG reflects a clustered pattern, indicating a complex interplay among various factors, such as seed dispersal mechanisms, environmental conditions, and biotic interactions. Notably, environmental factors like acidic soil conditions, low soil moisture content, and high canopy cover play crucial roles in shaping its distribution. To preserve the ecological balance within BBG and its surroundings, it is imperative to implement proactive management strategies to prevent the spread of *E. pinnatum* and other potentially invasive species. This study provides a crucial foundation for guiding such management efforts, emphasizing the importance of understanding the ecological dynamics driving invasive plant species collections within Botanical gardens.

CONCLUSION

The Bogor Botanical Garden (BBG) faces a significant challenge, hosting 78 potentially invasive plant species out of 469 globally recognized invasive species. It requires careful monitoring and management to prevent their spread beyond the boundaries of BBG. Among these species, *Epipremnum pinnatum* emerges as the most dominant, with 28 individuals, followed by *Angiopteris evecta*, *Litsea glutinosa*, and *Alpinia zerumbet*. The analysis underscores some dominant families, including Araceae, Lauraceae, Marattiaceae, Zingiberaceae, Bignoniaceae, and Arecaceae.

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Appendix 1. Summary of Potential Invasive Species in BBG Plant Collection

No	*Species*	Life form	Family	∑	Location in BBG
1	*Abrus precatorius*	T	Fabaceae	3	XXIV.B.TO.III.11, 21, 80
2	*Acacia concinna*	T	Fabaceae	2	XVII.E.48-48a
3	*Adenanthera pavonina*	T	Fabaceae	1	I.K.57
4	*Agave americana*	H	Agavaceae	6	II.O.II.42; II.O.VI.60; II.O.VIII.18, 30; II.O.IX.103, 105
5	*Ageratum conyzoides*	S	Asteraceae	1	XXIV.B.TO.I.31
6	*Albizia julibrissin*	T	Fabaceae	3	I.B.66a; I.K.11; XXV.A.1-1a
7	*Aleurites moluccana*	T	Euphorbiaceae	3	IX.A.92a; IX.E.96-a-b
8	*Alpinia zerumbet*	H	Zingiberaceae	12	XI.B.I.10; XI.B.II.45, 48-48a; XI.B.V.188; XI.B.II.9, 44; XI.B.I.8; XI.B.II.18; XI.B.I.16; XI.B.II.10, 15
9	*Alternanthera philoxeroides*	H	Amaranthaceae	2	XXIV.B.TO.I.13, 14
10	*Angiopteris evecta*	F	Marattiaceae	21	XIX.H28C.I.24; XIX.C.IV.5; XIX.C.V.11, 14, 15; XIX.C.IX.27, 28, 37, 38, 40; H56X.C.XI.45, 69, 73, 74-74a, 88, 105, 110, 131; XIX.C.IV.13; XIX.C.V.32
11	*Annona glabra*	T	Annonaceae	5	XX.D.129-129a; XX.D.41, 103-103a
12	*Ardisia crenata*	T	Myrsinaceae	2	XI.B.XIII.179; XXIV.B.TO.II.44
13	*Ardisia elliptica*	T	Myrsinaceae	3	XI.B.XVI.227; XX.C.120-120a
14	*Arundo donax*	S	Poaceae	2	XI.B.VI.231-231a
15	*Canna indica*	H	Cannaceae	4	XXIV.B.TO.I.28 ; XXIV.B.TO.I.27 ; XXIV.B.TO.II.41 ; XXIV.B.TO.III.26
16	*Castilla elastica*	T	Moraceae	3	VII.G.167a ; IX.D.44a ; VII.G.154
17	*Casuarina equisetifolia*	T	Casuarinaceae	5	XXIV.A.181-181a; XXIV.A.182a-182b; XX.D.232
18	*Cedrela odorata*	T	Meliaceae	3	III.C.73; III.E.52 ; III.C.2
19	*Cinnamomum camphora*	T	Lauraceae	7	XX.B.197 ; XX.B.112a; 114 ; XX.A.62-62a ; XX.B.113 ; XX.B.41
20	*Cinnamomum verum*	T	Lauraceae	7	XX.B.134-134a ; XX.B.225a ; VII.F.70 ; XX.B.192 ; XX.A.104 ; XIX.F.110 ; XX.B.178
21	*Citharexylum spinosum*	T	Verbenaceae	4	XI.G.17a; 18a ; XI.G.124-124a ; XII.B.VII.175 ; XI.A.23
22	*Clidemia hirta*	S	Melastomataceae	1	XXIV.B.TO.I.17
23	*Colubrina asiatica*	S	Rhamnaceae	1	XI.H.67-67a
24	*Dioscorea bulbifera*	C	Dioscoreaceae	6	XV.B.53; XV.B.140; XV.B.50a; XV.B.153; XV.B.192; XV.B.195
25	*Elaeis guineensis*	P	Arecaceae	3	V.L.56-56a; V.M.55; XI.C.72
26	*Epipremnum pinnatum*	C	Araceae	2	Y.102; Z.162; Z.164; Z.118; Z.158; Y.34-34a; Z.13; Z.14; Z.133; Z.146; Z.24; Z.26; Z.46; XI.B.VIII.243; XI.B.X.144; Y.47-47a; Y.103; Y.104; Y.28; Z.55; XIX.C.III.55
27	*Eriobotrya japonica*	T	Rosaceae	2	IV.H.129a; XI.B.IX.204-204a
28	*Eugenia uniflora*	T	Myrtaceae	1	V.C.101

29	*Flacourtia indica*	T	Flacourtiaceae	2	IV.F.131a; IV.F.177
30	*Flemingia strobilifera*	S	Fabaceae	1	XXIV.B.TO.III.88
31	*Funtumia elastica*	T	Apocynaceae	1	XV.J.B.IX.15
32	*Furcraea foetida*	H	Agavaceae	5	II.O.V.21; II.O.IX.20; II.A.77; II.A.6; II.O.VI.10-10b
33	*Haematoxylum campechianum*	T	Fabaceae	1	XV.I.VI.27a
34	*Hedychium coccineum*	H	Zingiberaceae	6	XI.B.IV.87; XI.B.VI.96; XI.B.VI.193; XI.B.VI.7; XI.B.VI.243; XI.B.V.136
35	*Hedychium coronarium*	H	Zingiberaceae	1	XXIV.B.TO.I.22
36	*Hedychium flavescens*	H	Zingiberaceae	5	XI.B.V.52; XII.B.I.44; XII.B.I.46; XII.B.II.78; XI.B.IV.206
37	*Hedychium gardnerianum*	H	Zingiberaceae	1	XI.B.III.198
38	*Hiptage benghalensis*	T	Malpighiaceae	9	XVII.H.56-561;60-60a;1a;55-55a;53a;139.
39	*Iris pseudacorus*	H	Iridaceae	2	XI.B.X.255-255a
40	*Jatropha gossypiifolia*	T	Euphorbiaceae	2	XXIV.B.154;135
41	*Lantana camara*	S	Verbenaceae	1	XXIV.B.TO.I.36
42	*Ligustrum lucidum*	T	Oleaceae	4	XXIV.A.283;XXIV.B.TO.III.51;IV.A.204-204a
43	*Ligustrum robustum*	T	Oleaceae	1	IV.A.163
44	*Limnocharis flava*	H	Limnocharitaceae	1	II.Q.C.36
45	*Litsea glutinosa*	T	Lauraceae	18	XX.A.1-1a;5a;75a;82;88;XX.B.25;40-40a;62-62a;IX.D.204;XX.C.53-53a-53b;81a;77
46	*Livistona chinensis*	P	Arecaceae	5	V.K.34-34a;V.H.46;XIII.L.3
47	*Lygodium japonicum*	F	Lygodiaceae	2	XIX.C.II.26-26a
48	*Melia azedarach*	T	Meliaceae	4	III.C.61;XV.J.B.III.18-18a;XXIV.A.290
49	*Merremia peltata*	C	Convolvulaceae	1	XV.G.98
50	*Morus alba*	T	Moraceae	5	XV.J.B.XXII.11a;XVI.I.G.31-31a;XXIV.B.TO.III.78;57
51	*Myriophyllum aquaticum*	H	Haloragaceae	2	II.Q.B.15; II.Q.C.91
52	*Nypa fruticans*	P	Asteraceae	1	II.J.5
53	*Opuntia ficus-indica*	H	Cactacea	2	II.O.IX.32;II.O.IX.12
54	*Paederia foetida*	C	Rubiaceae	4	XVII.C.118a;XVII.C.183,186;XXIV.B.TO.III.116
55	*Passiflora suberosa*	C	Passifloraceae	1	XVIII.A.93
56	*Phoenix canariensis*	P	Arecaceae	7	XIV.A.146; V.H.44a; XII.A.30,221;II.F.39; XII.A.10-10a
57	*Pimenta dioica*	T	Myrtaceae	2	V.C.87; XV.J.A.XXXV.10
58	*Pinus caribaea*	T	Pinaceae	3	V.F.104, 105-105a
59	*Piper aduncum*	T	Piperaceae	1	XXIV.A.282

60	*Pluchea indica*	S	Asteraceae	2	XXIV.B.116-116a
61	*Psidium cattleianum*	T	Myrtaceae	8	XV.J.A.XXX.12; XV.J.B.XXX.5a; XV.J.B.XXVI.15-15a, 16-16a; XV.J.B.XXVII.14-14a
62	*Psidium guajava*	T	Myrtaceae	3	XXV.A.72; XXIV.A.281; IX.D.33
63	*Rhodomyrtus tomentosa*	S	Myrtaceae	1	V.B.174
64	*Sacciolepis indica*	H	Poaceae	1	II.Q.B.56
65	*Sagittaria sagittifolia*	H	Alismataceae	1	II.Q.C.114
66	*Samanea saman*	T	Fabaceae	4	I.B.200; I.D.36-36a; IX.D.181
67	*Sansevieria trifasciata*	H	Liliaceae	1	XI.B.XI.21
68	*Schefflera actinophylla*	T	Araliaceae	4	XIII.J.269; XIII.J.251; XIII.J.177; XXIV.B.TO.III.132
69	*Solanum torvum*	S	Solanaceae	1	XXIV.B.TO.IV.
70	*Spathodea campanulata*	T	Bignoniaceae	4	IX.E.65; XI.H.29; XXIV.A.74-74a
71	*Syngonium podophyllum*	H	Araceae	8	Z.209; Y.77-77a; Z.57; Z.50; 108; 127; Y.63a
72	*Syzygium cumini*	T	Myrtaceae	5	XVI.I.I.7; V.A.128-128a; V.C.44; XV.J.A.XXVIII.7
73	*Syzygium jambos*	T	Myrtaceae	3	V.B.56a; V.C.129; XII.C.304
74	*Tabebuia heterophylla*	T	Bignoniaceae	6	XVI.G.126; XXIV.A.72-72a; XI.H.61-61a; XI.H.91a
75	*Tecoma stans*	S	Bignoniaceae	5	XV.J.B.XXII.14-14a; XX.E.14; XV.J.A.XXVII.5a; XV.J.A.XXVI.8a (var. *velutina*)
76	*Terminalia catappa*	T	Combretaceae	9	XIX.F.107; 127a; VII.H.11; 15; VII.F.2; XIX.F.63; II.F.37; VIII.A.25; 30
77	*Thunbergia grandiflora*	C	Acanthaceae	4	XV.F.35-35a; 43a; 82 (var. alba)
78	*Triphasia trifolia*	S	Rutaceae	8	XXIV.A.116; XV.I.II.2; XXIV.B.TO.III.1;2;9; XXIV.B.TO.III.8; XXIV.A.122-122a
	TOTAL			**294**	