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Research Article

Diversity of Fabaceae in the Universitas Palangka Raya Area, Central Kalimantan, Indonesia

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Abstract

The Fabaceae family (Leguminosae), belonging to the order Fabales, comprises approximately 630 genera and 18,000 species distributed worldwide. According to the modern phylogenetic classification proposed by the Legume Phylogeny Working Group (LPWG), Fabaceae is divided into six subfamilies: Cercidoideae, Detarioideae, Duparquetioideae, Dialioideae, Caesalpinioideae, and Faboideae. Members of this family include herbs, shrubs, and trees, with a wide range of ecological adaptations in tropical ecosystems. This study was conducted within the campus area of Universitas Palangka Raya to document the diversity of Fabaceae species, which has not been comprehensively recorded in this region. A field survey method was applied to collect and identify specimens based on morphological characteristics. A total of 18 Fabaceae species were recorded. Caesalpinioideae comprised 11 species, Faboideae 6 species, and Detarioideae 1 species. Growth forms included herbs, shrubs, and trees. Based on ecological status, 6 species were classified as native and 12 as introduced according to Plants of the World Online (POWO). This study provides baseline floristic data on Fabaceae diversity in the Universitas Palangka Raya area and contributes to taxonomic and biodiversity documentation in Central Kalimantan.

Keywords: angiospermae, exploration, eudicots, *Fabaceae*, morphology

1. INTRODUCTION

The area of Universitas Palangka Raya is located within a tropical peat swamp forest ecosystem in Central Kalimantan, Indonesia, covering approximately 5,350 ha [1,2]. This ecosystem is characterized by high biodiversity, including a wide range of angiosperm taxa. However, floristic documentation in this area remains incomplete, particularly for several plant groups, including the family Fabaceae.

Fabaceae is one of the largest families of angiosperms within the order Fabales, comprising approximately 630 genera and 18,000 species distributed widely across tropical and subtropical regions [3-5]. According to the modern phylogenetic classification proposed by the Legume Phylogeny Working Group [6], Fabaceae is divided into six subfamilies: Cercidoideae, Detarioideae, Duparquetioideae, Dialioideae, Caesalpinioideae, and Faboideae. This updated classification reflects phylogenetic relationships based on molecular data, replacing the traditional three-subfamily system.

Floristic studies on Fabaceae have been conducted in various regions of Kalimantan [7-11]. In addition, several studies on plant diversity within the Universitas Palangka Raya area have been reported, including investigations on Pteridophytes [12] and Nepenthes species [13], [2]. Nevertheless, information regarding the diversity and species composition of Fabaceae in the Universitas Palangka Raya area remains very limited and has not been specifically documented, indicating a significant gap in floristic data for this taxonomic group.

Therefore, this study aims to document the species diversity of Fabaceae in the Universitas Palangka Raya area and to analyze their morphological characteristics. The findings are expected to provide baseline floristic data for Fabaceae and contribute to taxonomic and conservation studies in Central Kalimantan.

2. MATERIALS AND METHODS

The study was conducted from 14 February to 24 August 2025 in the campus area of Universitas Palangka Raya, Central Kalimantan, Indonesia. The study area represents a campus landscape developed within a tropical peat swamp ecosystem. Field exploration was carried out

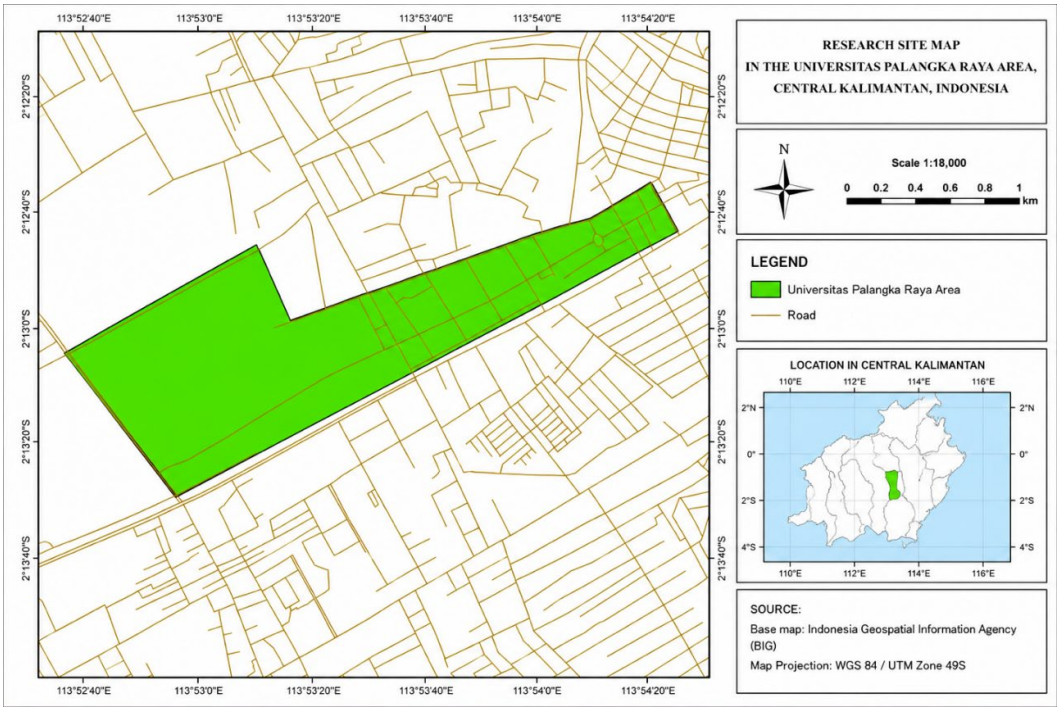

Figure 1. Map of the study area in Universitas Palangka Raya, Central Kalimantan, Indonesia.

using a purposive floristic survey approach, focusing on accessible habitats where Fabaceae taxa were encountered. Exploration covered major campus roads, building surroundings, open fields, drainage margins, and semi-natural vegetation patches (Figure 1)

All Fabaceae taxa encountered along the exploration routes were recorded. For each taxon, data on habit, habitat condition, geographic coordinates, local name, native or introduced status, and vegetative and reproductive morphological characters were documented. Morphological observations included stem, stipule, leaf arrangement, leaflet shape, inflorescence type, flower structure, fruit type, seed characters, and the presence of indumentum. Diagnostic characters were photographed directly in the field.

Specimens with adequate vegetative and reproductive material were collected as voucher specimens. The specimens were pressed, dried, labelled, and deposited in the Biology Laboratory, Faculty of Mathematics and Natural Sciences, Universitas Palangka Raya. Voucher numbers were assigned using the collector code YWS followed by the collection number. Taxonomic identification was conducted using regional taxonomic references, including [14–18]. Accepted names, author citations, synonymy, distribution, and native or introduced status were verified using Plants of the World Online. Subfamily placement followed the modern phylogenetic classification of the Legume Phylogeny Working Group [6].

3. RESULTS AND DISCUSSIONS

A total of 18 Fabaceae species were recorded in the Universitas Palangka Raya area. Based on the modern classification of Leguminosae proposed by the Legume Phylogeny Working Group, the recorded species belonged to three subfamilies: Caesalpinioideae, Faboideae, and Detarioideae [6,19]. Caesalpinioideae was the most species-rich subfamily, comprising 11 species or 61.1% of the total recorded species. Faboideae was represented by 6 species or 33.3%, whereas Detarioideae was represented by only 1 species or 5.6%, namely *Tamarindus indica*. The recorded growth forms consisted of 9 tree species, 5 herb species, and 4 shrub species, indicating that Fabaceae in the study area occupied both planted and spontaneous vegetation layers. The complete species list is presented in Table 1.

Table 1. List of Fabaceae species recorded in the Universitas Palangka Raya area, Central Kalimantan, Indonesia.

Subfamily	Species	Local name	Habit	Status
Caesalpinioideae	Caesalpinia pulcherrima (L.) Sw.	Kembang merak	Shrub	Introduced
	Delonix regia (Bojer ex Hook.) Raf.	Flamboyan	Tree	Introduced
	Senna siamea (Lam.) H.S.Irwin & Barneby	Johar	Tree	Introduced
	Adenanthera pavonina L.	Tanning bajang	Tree	Native
	Acacia auriculiformis A.Cunn. ex Benth.	Akasia	Tree	Introduced
	Acacia mangium Willd.	Akasia	Tree	Introduced
	Leucaena leucocephala (Lam.) de Wit	Petai cina	Tree	Introduced
	Mimosa pudica L.	Putri malu	Herb	Introduced
	Neptunia plena (L.) Benth.	Supan-supan	Herb	Introduced
	Parkia speciosa Hassk.	Petai	Tree	Native
	Samanea saman (Jacq.) Merr.	Trembesi	Tree	Introduced
Faboideae	Calopogonium mucunoides Desv.	Kalopo	Herb	Introduced
	Centrosema pubescens Benth.	Sentro	Herb	Introduced
	Crotalaria pallida Aiton	Orok-orok	Shrub	Native
	Grona triflora (L.) H.Ohashi & K.Ohashi	Rumput jarem	Herb	Native
	Grona heterocarpos (L.) H.Ohashi & K.Ohashi	Kasi	Shrub	Native
	Indigofera hirsuta L.	Jukut lulut	Shrub	Native
Detarioideae	Tamarindus indica L.	Asam jawa	Tree	Introduced

3.1. Key to the Recorded Fabaceae Species in the Universitas Palangka Raya Area

1a. Mature leaves modified into phyllodes; true leaflets absent or reduced 2
1b. Leaves with true leaflets, pinnate, bipinnate, or trifoliolate 3
2a. Phyllodes narrow, curved, with several prominent longitudinal veins; tree commonly planted along roadside …….. *Acacia auriculiformis*
2b. Phyllodes broader, elliptic to lanceolate, with prominent longitudinal veins; fast-growing plantation or shade tree ..... *Acacia mangium*
3a. Leaves sensitive, folding when touched; plant herbaceous, usually with prickly stems …….. *Mimosa pudica*
3b. Leaves not sensitive when touched 4
4a. Aquatic or semi-aquatic herb; stems spongy or floating; flowers yellow in compact heads……..... *Neptunia plena*
4b. Terrestrial herbs, shrubs, or trees 5
5a. Corolla papilionaceous, with standard, wing, and keel petals 6
5b. Corolla not papilionaceous; flowers actinomorphic or weakly zygomorphic ... 11
6a. Fruit inflated or bladder-like; flowers yellow; shrub or herbaceous shrub ..... *Crotalaria pallida*
6b. Fruit not inflated 7
7a. Plants twining or creeping vines with trifoliolate leaves 8
7b. Plants erect, ascending, or prostrate herbs/shrubs, not twining vines ……..... 9
8a. Flowers purple to bluish; pods hairy; plant commonly forming ground cover ..... *Calopogonium mucunoides*
8b. Flowers purple, resupinate; pods long and narrow; twining.....*Centrosema pubescens*
9a. Leaves imparipinnate with 3–9 leaflets; stems and fruits densely hairy; flowers pink ..... *Indigofera hirsuta*
9b. Leaves trifoliolate; fruits segmented into loments ……..... 10
10a. Prostrate or creeping herb with small leaflets and few-flowered inflorescences ..... *Grona triflora*
10b. Shrubby or ascending plant with larger leaflets and longer inflorescences …….. *Grona heterocarpos*
11a. Leaves paripinnate; pods thick, indehiscent, with acidic pulp.....*Tamarindus indica*
11b. Leaves bipinnate or pinnate; pods not thick with acidic pulp 12
12a. Leaves pinnate; flowers yellow in racemes or panicles; tree ..... *Senna siamea*
12b. Leaves bipinnate 13

13a. Flowers large and showy, red, orange, or yellow …..... 14
13b. Flowers small, aggregated in heads, spikes, or less showy inflorescences 15
14a. Shrub; flowers orange-red or yellow; stamens long-exserted; pods flat …….. *Caesalpinia pulcherrima*
14b. Tree; flowers large, scarlet to orange-red; leaves fern-like; pods large and woody ..... *Delonix regia*
15a. Inflorescence a large pendulous globose head; pods long, flat, with edible seeds ……..... *Parkia speciosa*
15b. Inflorescences not large pendulous globose …… 16
16a. Seeds bright red; tree with bipinnate leaves and small pale flowers.....*Adenanthera pavonina*
16b. Seeds not bright..... 17
17a. Flower heads white, globose; pods flat; small tree often planted or naturalized ……..... *Leucaena leucocephala*
17b. Large shade tree; crown broad; flower heads whitish-pink; pods dark and indehiscent ..... *Samanea saman*

3.2. Below are descriptions of three species representing each subfamily of Fabaceae

3.2.1. Parkia speciosa Hassk.

Parkia *speciosa* Hassk., *Flora* 25(2, Beibl. 1): 55 (1842) (Figure 2).

Description

Tree, dbh ca. 25 cm. Branching robust, numerous; branches cylindrical, brownish, bark rough grey-brown. Stem cylindrical, coarse. Leaves bipinnate, alternate; pinnae many, opposite; leaflets oblong, 18–42 pairs per pinna, 1–2.4 × 0.3–0.6 cm, apex and base rounded to slightly acute, margin entire; adaxial surface dark green, abaxial surface lighter green; venation pinnate; petiole 15–30 cm. Inflorescence a globose capitulum, terminal, pendulous, yellowish, ca. 6.5 cm long; peduncle ca. 5 cm. Flowers small, sessile; calyx tubular; corolla whitish-yellow, 6–8 × 2–3 mm; stamens numerous, exserted; style 1, 5–7 mm. Fruit a legume, elongate, flat, slightly curved, 20–21 × 2.3–3 cm, surface smooth; young fruit green, mature fruit brown; pulp whitish, bitter taste, characteristic odor. Seeds 10–12 per pod, oblong to ovoid, 2–3 × 1–1.5 cm, surface smooth and glossy.

Distribution

Widely distributed in Southeast Asia including Indonesia, Malaysia, Thailand, the Philippines, Vietnam, Myanmar, Bangladesh, and northeastern India [20].

Ecology and Locality

Collected behind the Auditorium Building, Universitas Palangka Raya, Central Kalimantan, Indonesia. Coordinates: −2.211888, 113.902783. Date: 16 February 2025 (YWS 017).

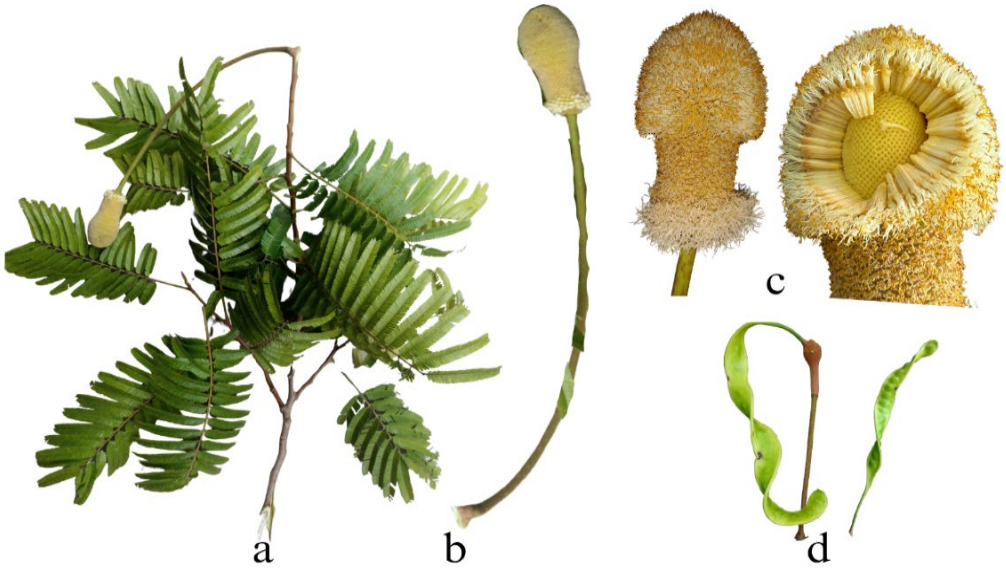

Figure 2. Morphological characterization of *Parkia speciosa* Hassk. (a) Branch; (b) Inflorescence type; (c) Flower; (d) Fruit.

Uses

Parkia speciosa is economically important as a food plant. Its seeds are consumed as vegetables and are rich in protein, lipids, and carbohydrates. Extracts also show potential antioxidant properties and applications in soil quality assessment [20].

3.2.2. Indigofera hirsuta L.

Indigofera hirsuta L., Sp. Pl. 2: 751. 1753 (Figure 3).

Description

Shrub, up to 1.5 m tall. Branching robust, spreading to erect; young branches densely pubescent, terete. Stem cylindrical, reddish-brown, pubescent. Stipules present, opposite, narrowly triangular to subulate, persistent, pubescent. Leaves imparipinnate, 3–9-foliolate; leaflets obovate to broadly obovate, 5–12 × 2–4 cm, apex and base obtuse, margin entire; adaxial surface dark green, abaxial surface light green; both surfaces densely pubescent; venation pinnate; petiole 0.8–1.2 cm. Inflorescence axillary and terminal racemes, ca. 6 cm long; peduncle 0.5–1 cm. Flowers pedicellate, 1–3 mm. Calyx campanulate, 5-lobed, densely pubescent, greenish-brown, 3–4 × 1–1.5 mm. Corolla papilionaceous, pink, 5–7 × 3–4 mm. Stamens 10, 0.5–0.9 mm; ovary 1; style 4–5 mm. Fruit a legume, cylindrical, slightly curved, 2–4 × 0.2–0.3 cm, densely pubescent; immature fruit green, mature fruit brown. Seeds 6–10 per pod, small, oblong, 1.5–2.5 × 1–1.5 mm, smooth, brown to dark brown when mature.

Distribution

Widely distributed in tropical and subtropical regions including Asia, Africa, northern Australia, and Pacific islands [21].

Ecology and Locality

Recorded in front of the PPG Building, Universitas Palangka Raya, Central Kalimantan, Indonesia. Coordinates: −2.215972, 113.899247. Date: 11 April 2025 (YWS013).

Uses

Indigofera hirsuta is used as a natural dye source in textile crafts (including weaving and batik), as traditional medicine, and as livestock forage [22].

3.2.3. Tamarindus indica L.

Tamarindus indica L., *Sp. Pl.* 1: 34 (1753); Miq., *Fl. Ind. Bat.* 1(1): 82 (1855); Backer, *Schoolflora Java* 420 (1911); Backer & Bakhuizen f., *Flora of Java* 1: 529 (1963); Hou, Larsen & Larsen, *Flora Malesiana* 12(2): 729 (1996). Type**:** LINN 49.2 (lectotype, LINN). (Figure 4).

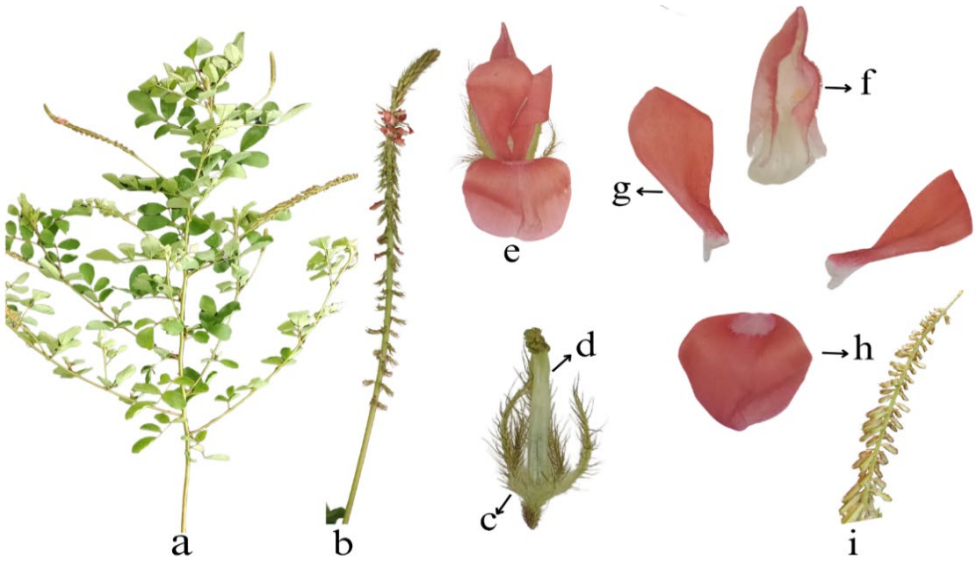

Figure 3. Morphological characters of *Indigofera hirsuta* L. (Fabaceae). (a) Branchlet; (b) Inflorescence type; (c) Calyx; (d) Stamens; (e) Corolla; (f) Keel petals; (g) Wing petals; (h) petal; (i) Fruit.

Description

Tree, dbh ca. 25 cm. Branching strong, irregular; branches terete, rough. Stem cylindrical, brownish, coarse. Leaves paripinnate, alternate; leaflets 9–11 pairs; oblong, opposite, 5–14 × 2–4 mm, apex obtuse, base obtuse to oblique, margin entire; adaxial surface green, abaxial surface pale green; venation pinnate; petiole ca. 5 mm. Inflorescence terminal raceme, compound, 5–9 cm long; peduncle 3–6 cm. Flowers 4-merous; pedicels 4–7 mm. Calyx 4-lobed, lanceolate-ovate, white, 5–6 × 3–5 mm, glabrous. Corolla 3-lobed, yellowish-white with reddish-brown streaks, ovate, 1–1.5 × 0.5–1 cm. Stamens 10, 2–3 mm; ovary 1; style 1–1.2 mm. Fruit a legume, indehiscent, elongate, slightly curved, 5–12 × 2–3 cm, surface rough; immature fruit greenish-white, mature fruit brown; pulp acidic, characteristic sour aroma. Seeds 6–9 per pod, oblong, 6–10 × 3–6 mm, hard, smooth, brownish-yellow when young, dark brown when mature.

Distribution

Native to Africa and widely naturalized throughout tropical Asia, including Indonesia, particularly Java [23].

Ecology and Locality

Recorded in front of the Department of Agricultural Cultivation Building, Universitas Palangka Raya, Central Kalimantan, Indonesia. Coordinates: −2.211368, 113.904652. Date: 23 February 2025 (YWS011).

Uses

Widely utilized as a spice and traditional medicinal plant. The acidic pulp is used in beverages, culinary preparations, and herbal medicine due to its characteristic sour–sweet flavor. The wood is also used as fuel and charcoal material [23].

3.2.4. Comparative Diagnostic Notes

Parkia speciosa is distinguished by its bipinnate leaves with numerous small leaflets, pendulous globose inflorescences, and long flat pods containing large edible seeds with a characteristic odor. It differs from *Samanea saman* by its pendulous capitula and elongated flat pods, whereas *Samanea saman* has a broad umbrella-shaped crown, whitish-pink flower heads, and dark indehiscent pods. It also differs from *Leucaena leucocephala* by its much larger inflorescences, larger pods, and larger seeds.

Indigofera hirsuta is characterized by its erect to spreading shrubby habit, imparipinnate leaves with 3–9 leaflets, densely pubescent stems, calyx, and fruits, and pink papilionaceous flowers. It differs from *Crotalaria pallida* by having non-inflated pods and densely hairy vegetative parts. It differs from *Grona triflora* and *Grona heterocarpos* by its imparipinnate leaves and non-lomented fruits.

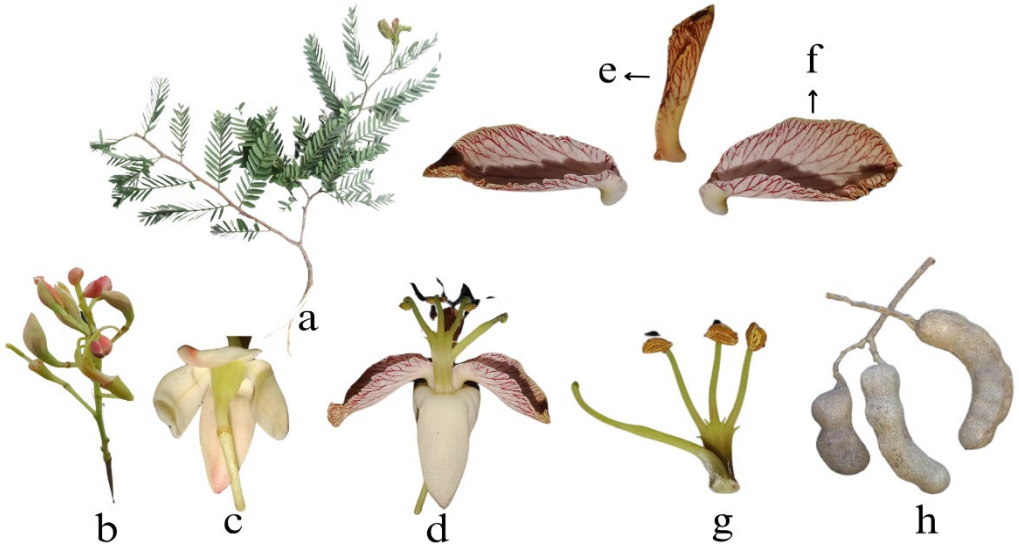

Figure 4. Morphological characters of *Tamarindus indica* L. (Fabaceae). (a) Branchlet; (b) Inflorescence; (c) Calyx; (d) Flower; (e) Petal; (f) Petal; (g) Stamens; (h) Fruit.

Tamarindus indica is distinguished by paripinnate leaves with numerous small opposite leaflets, yellowish flowers with reddish-brown streaks, and thick indehiscent pods containing acidic pulp. It differs from *Senna siamea*, which also has pinnate leaves, by its fleshy indehiscent pods and reddish-striped flowers. It also differs from *Delonix regia* and *Caesalpinia pulcherrima* by having less showy flowers and characteristic sour fruit pulp.

3.3. Discussion

The dominance of Caesalpinioideae may be explained by the high number of woody, ornamental, shade, and multipurpose species planted in the campus landscape, including *Delonix regia*, *Senna siamea*, *Acacia auriculiformis*, *Acacia mangium*, *Leucaena leucocephala*, and *Samanea saman*. Several members of Caesalpinioideae, particularly taxa formerly treated within mimosoid legumes, are known for their ecological tolerance, rapid growth, nitrogen-fixing ability, and capacity to establish in open or disturbed habitats [6, 24, 25]. In the Universitas Palangka Raya area, open spaces, road margins, building surroundings, and drainage-influenced areas provide suitable microsites for these species. Therefore, the dominance of Caesalpinioideae in this study appears to reflect both ecological adaptability and human-mediated planting.

The high proportion of introduced species also indicates strong anthropogenic influence on Fabaceae composition within the campus area. Of the 18 recorded species, 12 species were categorized as introduced, while only 6 species were native, based on Plants of the World Online [5]. Introduced Fabaceae in the study area are mainly used as ornamental plants, shade trees, cover crops, forage plants, or soil-improvement species. For example, *Acacia mangium* is widely used in forestry and degraded land rehabilitation because of its rapid growth and nitrogen-fixing capacity, although it may also pose ecological risks when planted outside its native range [24]. Similarly, *Leucaena leucocephala* has been widely introduced as a multipurpose legume, but it is also reported to spread in roadsides, wastelands, cultivated lands, riverbanks, and forest edges, where it may alter vegetation structure and suppress native species regeneration [25].

Although introduced Fabaceae may provide ecological functions such as shade, litter input, erosion control, soil cover, and nitrogen enrichment, their dominance may also reduce the visibility of native peat-swamp-associated flora and alter local vegetation composition. This finding suggests that the campus landscape is not only a remnant of peat swamp vegetation but also a human-shaped green space influenced by planting, disturbance, drainage, and land-use conversion.

Peat swamp environments are generally characterized by acidic, nutrient-poor, waterlogged, and hydrologically dynamic conditions [26]. However, the present study area has been modified by campus development, drainage, roads, buildings, and open green spaces. Such disturbance may create drier and more open microsites that favor introduced and disturbance-tolerant Fabaceae. Herbaceous and shrubby Faboideae species such as *Calopogonium mucunoides*, *Centrosema pubescens*, *Crotalaria pallida*, *Grona triflora*, *Grona heterocarpos*, and *Indigofera hirsuta* were mainly associated with open habitats, suggesting their ability to colonize disturbed ground with high light availability. Similar patterns have also been reported in floristic studies of Fabaceae and associated vegetation in disturbed or human-influenced habitats in Kalimantan and other Indonesian regions [27,9-11].

From a conservation perspective, the presence of native species such as *Adenanthera pavonina*, *Parkia speciosa*, *Crotalaria pallida*, *Grona triflora*, *Grona heterocarpos*, and *Indigofera hirsuta* is important because these taxa represent the remaining native Fabaceae component within a disturbed campus landscape. Floristic documentation of these species provides baseline information for future monitoring, especially in

relation to vegetation change, introduced species expansion, and peatland habitat management. Further studies should combine floristic inventory with quantitative vegetation sampling, soil analysis, peat depth measurement, hydrological observation, and molecular identification to better understand Fabaceae diversity and adaptation in tropical peat swamp landscapes.

4. CONCLUSIONS

A total of 18 species of Fabaceae were documented in the Universitas Palangka Raya area, consisting of three subfamilies: Caesalpinioideae, Faboideae, and Detarioideae. Caesalpinioideae was the dominant subfamily, while the recorded species exhibited diverse growth forms, including herbs, shrubs, and trees. Based on ecological status, introduced species were more dominant than native species, indicating strong anthropogenic influence on vegetation composition within the campus environment. This study provides baseline floristic and taxonomic information on Fabaceae diversity in Central Kalimantan and contributes to future biodiversity documentation and conservation studies.

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Author Contributions

Y.W.S. conducted the field survey, collected plant specimens, recorded morphological data, prepared the initial species list, and drafted the manuscript. R.W.L. conceptualized the study, designed the research framework, supervised the taxonomic work, validated species identification, and revised the manuscript critically for intellectual content. U.N.F. contributed to taxonomic verification, literature review, and manuscript revision. F.A. assisted with field documentation, data organization, and preparation of figures and tables. D. assisted with field observation, specimen documentation, and data checking. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflict of interest.

DECLARATION OF GENERATIVE AI

Not applicable.

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