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Diversity and Morphological Characteristics of the Family Anacardiaceae in Percut Sei Tuan District, Deli Serdang Regency

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ABSTRACT

The Anacardiaceae family holds significant ecological and economic value in tropical Asia, including Indonesia, as a source of fruits, timber, and valuable secondary metabolites. This study aimed to identify and describe the species diversity and morphological characteristics of Anacardiaceae in Percut Sei Tuan District, Deli Serdang Regency. The research was conducted from December 2025 to February 2026 using a descriptive exploratory method involving field observation, specimen collection, and morphological analysis. Sampling followed the exploration method of Rugayah et al., while morphological observations were based on de Vogel and Rifai. Species identification was conducted using taxonomic literature from the Anacardiaceae series of Flora Malesiana and herbarium specimens. The results recorded five species of Anacardiaceae: *Mangifera indica*, *Mangifera odorata*, *Mangifera foetida*, *Anacardium occidentale*, and *Spondias dulcis*. *Mangifera indica* was the most dominant species, comprising seven cultivated cultivars. Species differentiation was based on vegetative and generative morphological traits, including leaf type, shape, apex, texture, inflorescence type, fruit, and seed characteristics. The findings indicate relatively high diversity of Anacardiaceae in the study area, particularly within the genus *Mangifera*, influenced by environmental variation and human cultivation practices.

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Introduction

The Anacardiaceae family has significant ecological and economic value in tropical Asia, including Indonesia, as a source of fruits, timber, and valuable secondary metabolite compounds widely utilized in the food, pharmaceutical, and industrial sectors (Mitchell et al., 2022). The main genera of this family commonly used as food sources are *Mangifera* (mango group) and *Spondias* (hog plum). Members of this family not only contribute to local food security but also have great potential as sources of germplasm and as learning materials for biology education based on

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local environmental resources (Ishaq et al., 2026).

Anacardiaceae exhibits vegetative characteristics as trees, erect shrubs, climbers, or lianas, and very rarely epiphytic shrubs. The latex or resin often has a turpentine-like odor and turns black upon exposure to air. Leaves are often clustered at the branch tips; they may be simple, trifoliolate, or odd-pinnate; petioles are often thickened at the base, rarely subsessile or sessile; leaf arrangement is spiral or alternate (opposite or decussate only in *Bouea*), sometimes nearly whorled; and leaf margins are entire (Hou, 1978).

The generative characteristics include terminal or axillary inflorescences in the form of thyrsoids or panicles. Flowers are small, actinomorphic, and 3–5-merous. The perianth is usually bipartite; sepals are fused at the base and lobed, imbricate or valvate in bud; petals are free or basally fused on an elongated receptacle. Stamens are arranged in one or two whorls; filaments are slender and sometimes fused at the base (e.g., *Anacardium*); anthers are ovoid-oblong with two locules containing four pollen sacs. The ovary is usually superior. The stigma is 1–5-lobed (rarely more), with lobes free from each other. The fruit is a drupe or accessory fruit with a thin exocarp; the mesocarp is usually fleshy and fibrous; and the endocarp is hard. Seeds are solitary (Lu, 1980).

In Indonesia, this family comprises 22 genera, including two introduced genera (*Anacardium* and *Lannea*), and the most species-rich genus is *Mangifera*, which consists of approximately 38 species (Mustaqim et al., 2021–present). Sumatra is one of the centers of Anacardiaceae diversity in Indonesia, particularly for the genus *Mangifera*, which includes many native and endemic species distributed from lowland to hill forests (Bompard, 1991). Taxonomic and phylogenetic studies have shown that several *Mangifera* species from Sumatra, such as *Mangifera sumatrana*, exhibit distinct morphological traits and genetic relationships compared to their relatives, highlighting the high diversity and evolutionary complexity of Anacardiaceae on the island (Harsono et al., 2016; Fitmawati et al., 2022). This indicates that Sumatra plays an important role as a center of diversification and evolution of this family in the Malesian region (Harahap et al., 2017).

Percut Sei Tuan District is one of the subdistricts in Deli Serdang Regency, directly bordering Medan City, and is characterized by diverse land-use dynamics such as residential areas, agriculture, and coastal ecosystems including mangroves. These environmental variations provide suitable conditions for the growth of various members of the Anacardiaceae family, which are known for their adaptability to tropical ecosystems, both as cultivated plants and wild species (Elfayetti et al., 2024; Sinabang et al., 2024). Therefore, this study aims to identify and document the species of Anacardiaceae found in Percut Sei Tuan and to describe their morphological characteristics.

Materials and Methods

Research Location and Time

This study was conducted from November 2025 to February 2026 in Percut Sei Tuan District, Deli Serdang Regency. The samples used in this study consisted of all species and varieties belonging to the family Anacardiaceae found in the study area.

Types of Research

This research is a descriptive study carried out through observation, identification, and morphological characterization of plant traits.

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Data Collection Techniques

Specimen collection was conducted using an exploratory method following the procedures of Rugayah et al. (2004), while morphological observation procedures followed the standard methods of de Vogel (1987) and Rifai (2017).

Data Analysis

Sample verification and identification were carried out with reference to Hou (1978). In addition, identification was also conducted by comparing specimens with those available at the Herbarium Bogoriense (BO), as well as online collections from the Naturalis Biodiversity Center (https://bioportal.naturalis.nl/en) and Plants-JSTOR (https://plants.jstor.org/). Descriptions and identification keys for each species in the Percut Sei Tuan area were prepared based on the observed morphological characteristics.

Results and Discussion

The observations conducted in Percut Sei Tuan District, Deli Serdang Regency, revealed five species of the family Anacardiaceae in the area, namely mango (*Mangifera indica* L.), kuweni (*Mangifera odorata* Griff.), bacang (*Mangifera foetida* Lour.), cashew (*Anacardium occidentale* L.), and kedondong (*Spondias dulcis* Forst.). Mango (*Mangifera indica*) was the most abundant species, showing the highest number of individuals and the greatest variation compared to the other species. Seven cultivated mango cultivars were recorded, namely Arumanis mango (*Mangifera indica* 'Arumanis'), Kiojay or Thailand mango (*Mangifera indica* 'Kio Jay'), Golek mango (*Mangifera indica* 'Golek'), Apel mango (*Mangifera indica* 'Apel'), Udang mango (*Mangifera indica* 'Udang'), Gedong mango (*Mangifera indica* 'Gedong'), and Manalagi mango (*Mangifera indica* 'Manalagi').

Observations of qualitative and quantitative morphological characters of the five Anacardiaceae species (mango, kuweni, bacang, cashew, and kedondong) were carried out as detailed in Table 1 and Table 2. Qualitative characters included root form and type; stem shape, stem surface, and growth type; leaf type, lamina shape, and leaf apex type; flower type, shape, and color, as well as inflorescence, fruit, and seed characteristics. Quantitative characters included stem length, height, and diameter; leaf length and width; and the length of inflorescences and fruits. These characters were subsequently used in the construction of a dichotomous identification key for the species.

Table 1. Qualitative Characteristics of Five Species of the Family Anacardiaceae

No.	Qualitative Characters	Species Code
1	Root type: taproot	1, 2, 3, 4, 5
2	Root system: branched	1, 2, 3, 4, 5
3	Stem type: woody	1, 2, 3, 4, 5
4	Stem shape: cylindrical	1, 2, 3, 4, 5
5	Stem surface: Rough and wrinkled	1, 2, 3, 4
6	Stem surface: Smooth	5
7	Growth form: Pseudo-monopodial	1, 2, 3, 4
8	Growth form: Sympodial from the base	5
9	Leaf apex: acuminate to acute	1, 3, 5
10	Leaf apex: acute to obtuse	2

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11	Leaf apex: Rounded	4
12	Leaf blade shape: oblong to lanceolate	1, 2, 3, 5
13	Leaf blade shape: oblong to ovate	4
14	Leaf type: simple	1, 2, 3, 4
15	Leaf type: odd-pinnate compound	5
16	Leaf arrangement: alternate	1, 2, 3, 4, 5
17	Stipule Presence: absent	1, 2, 3, 4, 5
18	Leaf base: acute	1, 2
19	Leaf base: attenuate	3, 4
20	Leaf base: acuminate	5
21	Leaf margin: Undulate with acute apex	1, 2, 4
22	Leaf margin: Entire to slightly undulate margin	3, 5
23	Leaf venation type: pinnate	1, 2, 3, 4, 5
24	Leaf surface: smooth	1, 2, 3, 4, 5
25	Leaf color: light green to green	1, 4, 5
26	Leaf color: Dark green	2, 3
27	Flowers in inflorescences	1, 2, 3, 4, 5
28	Inflorescence type: panicle	1, 2, 3, 4, 5
29	Flower type: bisexual	1, 2, 3, 4, 5
30	Flower color: red-yellowish	1, 5
31	Flower color: maroon-greenish	2
32	Flower color: red-bluish	3
33	Flower color: white turning red	4
34	Fruit type: drupe	1, 2, 3, 5
35	Fruit type: accessory fruit	4
36	Fruit shape: rounded	1, 3
37	Fruit shape: oblong	1, 2, 5
38	Fruit shape: reniform	4
39	Fruit color: green when young, yellow when ripe	1, 2
40	Fruit color: greenish-yellow when ripe	3, 5
41	Fruit color: yellow to red when ripe	4
42	Fruit aroma: odorless	4, 5
43	Fruit aroma: slightly fragrant	1
44	Fruit aroma: strongly fragrant	2
45	Fruit aroma: unpleasant	3
46	Fruit latex: non or slightly irritant	1, 4, 5
47	Fruit latex: mildly irritant	2
48	Fruit latex: strongly irritant	3
49	Number of seeds: single, fibrous	1, 2, 3, 5
50	Number of seeds: single, non-fibrous	4

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Table 2. Quanitative Characteristics of Five Species of the Family Anacardiaceae

No.	Qualitative Characters	Qualitative Characters	Species Code
1	Root length	±2–5 m (taproot, estimated)	1
2	Stem height	10–40 m	1
3	Stem diameter	30–100 cm	1
4	Leaf length	8–40 cm	1
5	Leaf width	2–10 cm	1
6	Inflorescence length	10–35 cm	1
7	Fruit length	5–30 cm	1
8	Root length	not clearly measured (deep taproot)	2
9	Stem height	10–20 m	2
10	Stem diameter	30–80 cm	2
11	Leaf length	12–35 cm	2
12	Leaf width	4–10 cm	2
13	Inflorescence length	15–50 cm	2
14	Fruit length	9–13 cm	2
15	Root length	not measured (deep taproot)	3
16	Stem height	15–30 m	3
17	Stem diameter	40–100 cm	3
18	Leaf length	10–35 cm	3
19	Leaf width	6–15 cm	3
20	Inflorescence length	10–30 cm	3
21	Fruit length	12–15 cm	3
22	Root length	±3–6 m (taproot)	4

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23	Stem height	8–15 m	4
24	Stem diameter	20–50 cm	4
25	Leaf length	13–22 cm	4
26	Leaf width	5–10 cm	4
27	Inflorescence length	15–25 cm	4
28	Fruit length	4–8 cm	4
29	Root length	shallow to moderate taproot	5
30	Stem height	2–5 m (shrub/small tree)	5
31	Stem diameter	10–30 cm	5
32	Leaf length	5–8 cm	5
33	Leaf width	3–6 cm	5
34	Inflorescence length	24–40 cm	5
35	Fruit length	10–15 cm	5

Notes of Species Code at Table 1 and Table 2:
1: Mango (*Mangifera indica*)
2: Kuweni (*Mangifera odorata*)
3: Bacang (*Mangifera foetida*)
4: Cashew (*Anacardium occidentale*)
5: Kedondong (*Spondias dulcis*)

Determination key of Anacardiaceae Species in Percut Sei Tuan District

1 a. Stem bark rough, furrowed; stem type pseudo-monopodial; leaves simple… 2
b. Stem bark smooth; stem type sympodial from the basal region; leaves odd-pinnate compound ..... *Spondias dulcis*
2 a. Leaf blade oblong to ovate; secondary veins usually < 15 pairs; leaf apex obtuse torounded; accessory fruit ..... *Anacardium occidentale*
b. Leaf blade oblong-lanceolate; secondary veins usually ≥ 15 pairs; leaf apex acute to acuminate 3
3 a. Leaf texture thick and rigid; fruit aroma unpleasant; fruit fibers coarse; latex strongly irritant..... *Mangifera foetida*
b. Leaf texture thin and flexible; fruit aroma fragrant to slightly fragrant; fruit fibers fine; latex non- or mildly irritant…….. 4
4 a. Leaf apex obtuse; flower color maroon-greenish; fruit aroma strongly fragrant; latex mildly irritant ..... …… *Mangifera odorata*
b. Leaf apex acuminate; flower color reddish to yellowish; fruit aroma slightly fragrant; latex non- or weakly irritant…..... *Mangifera indica*

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Description of Each Anacardiaceae Species in Percut Sei Tuan District

1. Mango (*Mangifera indica* L.)

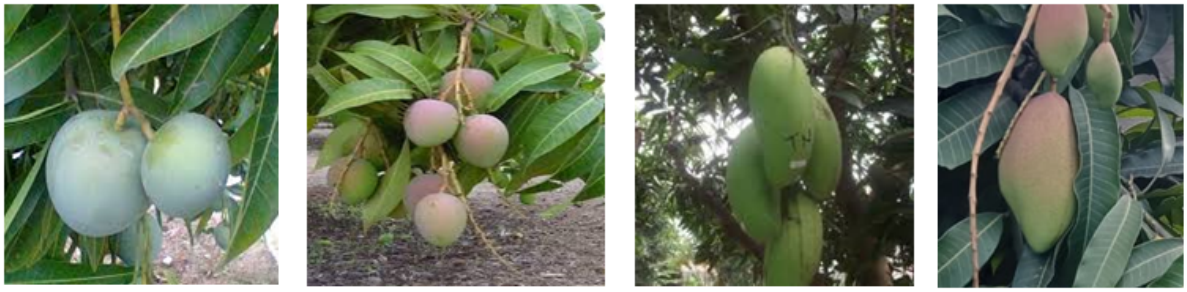
Mangifera indica found in Percut Sei Tuan District exhibits morphological characteristics as a tree habit, with a height ranging from 10–20 m, a rounded to oval canopy, and sympodial branching at the distal part of the crown. The stem is characterized by brown bark, which is smooth in young stages and gradually becomes rough, furrowed, and wrinkled with age. In addition, the presence of white latex exudate from injured tissues is a distinctive character of the family Anacardiaceae, supporting the identification of this species. These characteristics are consistent with the descriptions reported by Hou (1978) and Bompard (1991).

Leaf characters show simple leaves with a spiral arrangement; petioles are 2–6 cm long and grooved on the adaxial surface. The leaf blades are oblong to oblong-lanceolate, measuring 12–30 × 3.5–6.5 cm, with 20–25 pairs of lateral veins. Young leaves are maroon, turning light green and eventually dark green at maturity. However, Hermanto et al. (2013) reported a wider leaf size range of 8–40 × 2–10 cm, indicating considerable intraspecific variation. This variation is presumed to be associated with differences in cultivars as well as environmental conditions (Ansari et al., 2026).

The generative characters of mango include a terminal panicle inflorescence measuring 20–35 cm in length, with small flowers (approximately 4–6 mm). The polygamous flower structure, consisting of one fertile stamen and the presence of staminodes, is a diagnostic characteristic of the genus *Mangifera* (Hou, 1978). The fruit size ranges from 5–20 × 3–10 cm, generally smaller than the range reported by Morton (1987), which may reach up to 30 cm in length.

The mango cultivars (*Mangifera indica* L.) recorded in Percut Sei Tuan District include Arumanis, Udang, Manalagi, Apel, Gedong, Golek, and Kio Jay. These cultivars can generally be distinguished by fruit shape, aroma, taste, and leaf morphology (Zhang et al., 2020). Based on their distribution, the most commonly found cultivar in the area is Arumanis mango.

(a) (b) (c)



(d) (e) (f) (g)

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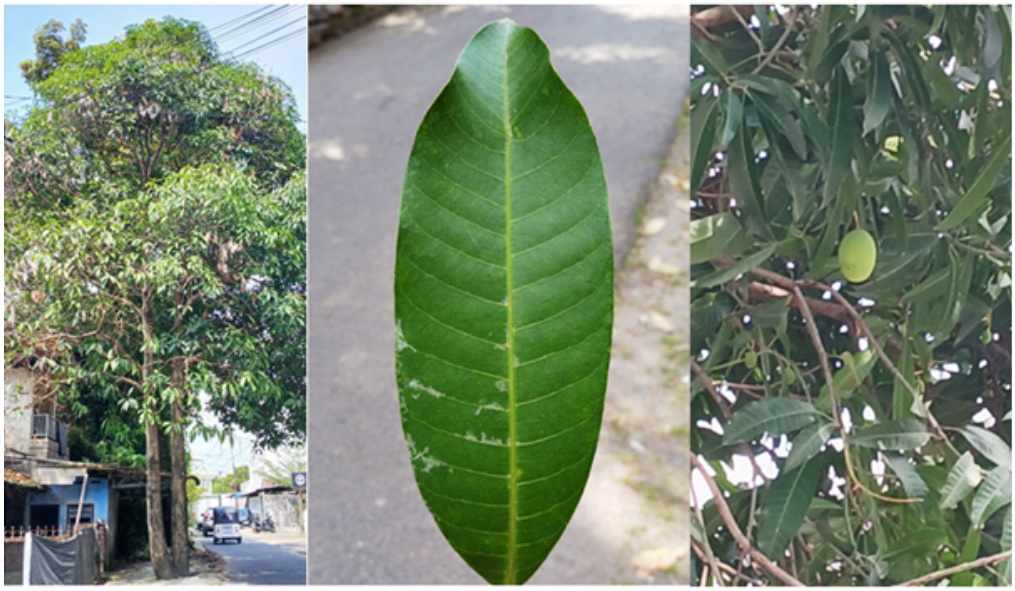
Figure 1. Mango fruits found in Percut Sei Tuan District: (a) Arumanis; (b) Udang; (c) Manalagi; (d) Apel; (e) Gedong; (f) Golek; (g) Kio Jay (Thailand).

2. Kuweni (Mangifera odorata Griff.)

Mangifera odorata exhibits vegetative morphological characteristics as an erect tree habit with sympodial branching at the terminal part of the crown. The leaves are simple and arranged spirally (alternate); petioles are 3–7 cm long; the leaf blades are elliptic to elliptic-lanceolate, measuring approximately 12–35 × 4–10 cm, with a coriaceous to subcoriaceous texture. The venation is pinnate and clearly visible, especially on the abaxial surface. Leaf apices are generally acuminate (Hou, 1978; Bompard, 1991).

Reproductive characteristics include a terminal panicle inflorescence measuring about 15–50 cm in length, composed of numerous small flowers. The flowers are small (approximately 4–6 mm), polygamous, with a pentamerous perianth. The calyx and corolla are generally greenish-yellow with slight variation in coloration. The androecium consists of one fertile stamen accompanied by several staminodes, which is a diagnostic feature of the genus *Mangifera* (Hou, 1978).

The fruit is a drupe, elliptic to oblong in shape, measuring 5–15 cm in length. The mesocarp is fleshy and finely fibrous, with a relatively strong and distinctive aroma, which serves as one of the distinguishing characters compared to other species such as *Mangifera foetida*, which generally has more rounded fruits with a thicker pericarp (Bompard, 1991).



(a) (b) (c)

Figure 2. Tree (a), leaf (b), and fruit (c) of *M. Odorata*

3. Bacang (*Mangifera foetida*)

Mangifera foetida is a tree that can reach a height of up to approximately 30 m and produces a yellowish-brown exudate. The leaves are simple and arranged spirally; petioles are 3–5 cm long; leaf blades are elliptic to lanceolate, measuring approximately 16–30 × 5–8 cm, with a coriaceous (thick and rigid) texture, glabrous surface, and pinnate venation. These morphological characteristics are consistent with the descriptions reported by Hou (1978) and Bompard (1991), although a wider range of leaf size variation has also been reported by Singh et al., (2014) and Fitmawati et al., (2010), indicating considerable morphological diversity in

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leaf traits within the genus *Mangifera*, both among species and cultivars.

The inflorescence is a terminal panicle composed of numerous small flowers, consistent with the general characteristics of the genus *Mangifera*. The flowers are polygamous, with one fertile stamen and several staminodes (Hou, 1978). The fruit is a drupe, globose to obovoid in shape, measuring approximately 10–18 cm in length (Bompard, 1991); the mesocarp is fibrous with a strong fetid odor, which is a key distinguishing feature of this species within the genus. Compared with *Mangifera odorata*, *M. foetida* has more spherical and larger fruits, with a thicker pericarp and coarser mesocarp fibers, whereas *M. odorata* typically has more elongated fruits, a more fragrant aroma, and finer flesh texture (Bompard, 1991).

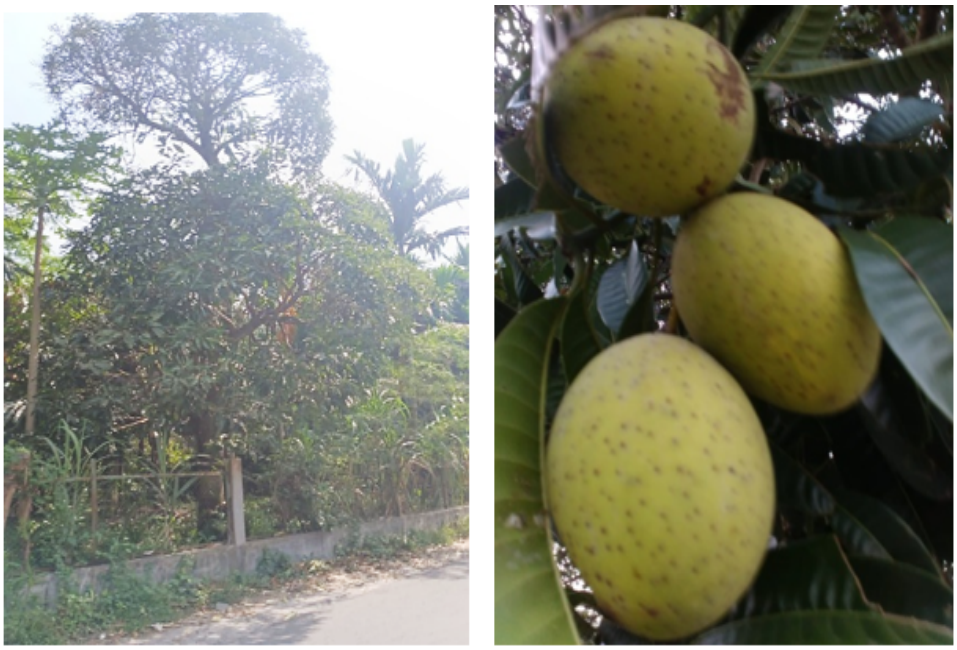

Figure 3. Tree and fruit of *M. Foetida*

4. Cashew (*Anacardium occidentale*)

Anacardium occidentale is a species of the family Anacardiaceae originating from Brazil and has been widely distributed in tropical regions, including Southeast Asia. This species is a tree with an erect habit, reaching approximately 7 m in height, with a spreading crown and sympodial branching near the base of the trunk. The stem is woody, with grayish-brown bark and produces resinous exudate. The leaves are simple and arranged spirally, clustered toward the branch tips; leaf blades are obovate, measuring approximately 6–20 × 5–10 cm, coriaceous in texture, glabrous, with obtuse to rounded apices (Hou, 1978).

The inflorescence is a terminal panicle; the peduncle and sepals are green, while the petals, stamens, and pistils are white to pink in color. The fruit is an accessory fruit (pseudocarp) that develops from an enlarged pedicel (hypocarpium), forming a pear-shaped, fleshy, juicy structure that turns yellow to red when ripe. The true fruit is kidney-shaped and is located at the tip of the accessory structure. The true fruit has a hard pericarp containing phenolic compounds such as cardol and anacardic acid (Morton, 1987; Orwa et al., 2009). This fruit structure is a key diagnostic character that distinguishes the genus *Anacardium* from other members of the family Anacardiaceae (Hou, 1978).

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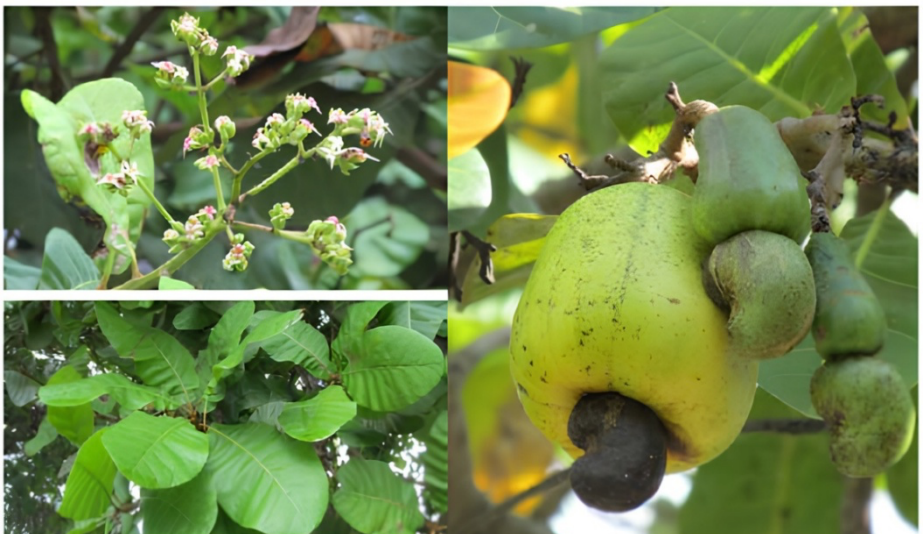

Figure 4. Leaves, flowers, and fruit of cashew

5. Kedondong (*Spondias dulcis*)

Kedondong (*Spondias dulcis* Forst.) is a fruit species native to South and Southeast Asia. This plant has a tree habit, is erect, and exhibits sympodial branching from the base of the stem. The stem surface is smooth and greenish-white in color. The leaves are odd-pinnately compound; leaflets are oblong, with an acute base and acuminate apex, green in color, measuring 5–8 × 3–5 cm, with entire margins and a smooth, glossy surface.

The inflorescence is a panicle, 20–40 cm long, with a green peduncle; flowers are white to yellowish in color. The calyx and corolla consist of 4–5 lobes, lanceolate in shape; there are eight stamens, which are yellow in color. The fruit is a drupe, oblong in shape, measuring 4–7 cm in length, fibrous, greenish-yellow when mature, and has a sour taste. The seed is solitary, large, fibrous, and rigid (Hou, 1978).

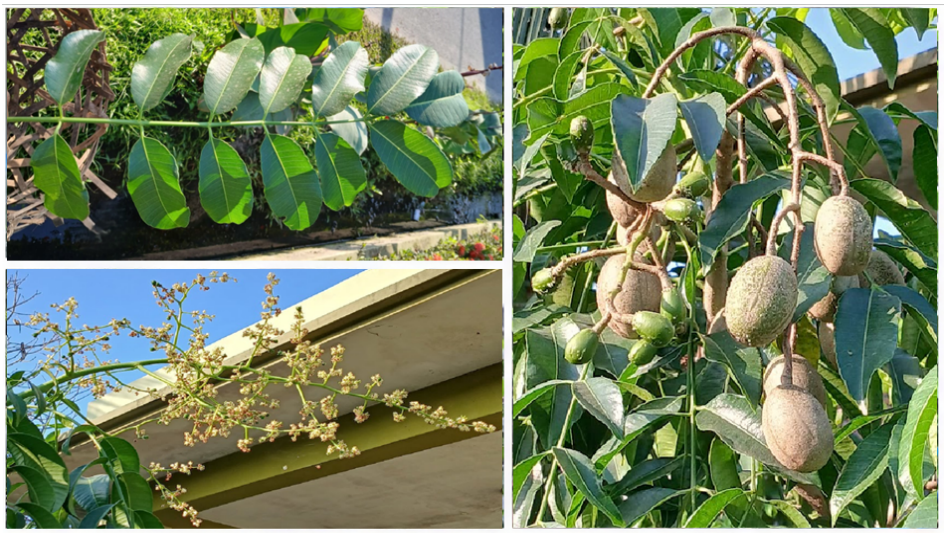

Figure 5. Leaves, inflorescence, and fruits of *Kedondong*

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Conclusions

The observations conducted in Percut Sei Tuan District revealed five species of the family Anacardiaceae, namely mango (*Mangifera indica* L.), kuweni (*Mangifera odorata*), bacang (*Mangifera foetida* Lour.), cashew (*Anacardium occidentale* L.), and kedondong (*Spondias dulcis* Forst.). Differences among species within the family Anacardiaceae are determined by a combination of vegetative and generative characteristics, including leaf type, leaf shape and apex, number of lateral veins, leaf texture, as well as fruit and seed traits. The most frequently encountered and morphologically variable species is mango (*Mangifera indica* L.), which comprises seven cultivars. Each mango cultivar can generally be distinguished based on fruit shape, aroma, taste, and leaf morphology.

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