



## MARGA *Cnidoscolus* Pohl (*EUPHORBIACEAE*) DI JAWA

### THE GENUS *Cnidoscolus* Pohl (*EUPHORBIACEAE*) IN JAVA

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#### Abstrak

Informasi mengenai suku *Euphorbiaceae* di Pulau Jawa telah direkam dalam buku Flora of Java Volume 1 oleh C.A. Backer and R.C. Bakhuizen van den Brink Jr. Meskipun demikian, informasi terkini mengenai *Euphorbiaceae* di Jawa belum tersedia sejak buku tersebut terbit. Beberapa jenis tambahan telah ditemukan dari Jawa dan penelitian ini bertujuan untuk melaporkan informasi tambahan mengenai *Euphorbiaceae* yang ada di Jawa. penelitian telah dilakukan di Banten, Jawa Barat, Jawa Tengah, Jawa Timur, dan Yogyakarta pada bulan Maret hingga September 2019. Hasil penelitian menunjukkan adanya suatu marga tambahan di Jawa, yaitu *Cnidoscolus* Pohl. Marga tersebut hanya terdiri dari satu jenis saja di Jawa, yaitu *C. aconitifolius* (Mill.) I.M. Johnst. Secara taksonomi, jenis ini dibagi menjadi 2 anak jenis, yakni *C. aconitifolius* subsp. *aconitifolius* and *C. aconitifolius* subsp. *polyanthus* (Pax & K.Hoffm.) Breckon. Berdasarkan bentuk bunga betinanya, spesimen dari Jawa telah diidentifikasi sebagai *C. aconitifolius* subsp. *aconitifolius*. Tumbuhan ini berasal dari Meksiko Utara dan Mesoamerika dan telah umum dibudidayakan sebagai tanaman sayur di Jawa. Di kawasan Malesia, *C. aconitifolius* telah dibudidayakan sebelumnya di Brunei, Singapura, dan Filipina. Oleh karena itu, keberadaannya di Jawa ditetapkan sebagai sebuah rekaman distribusi baru untuk kawasan Malesia.

**Kata kunci:** Chaya; *Cnidoscolus*; *Euphorbiaceae*; Jawa; Malesia

#### Abstract

The information on *Euphorbiaceae* in Java island has been recorded in the Flora of Java Volume 1 by C.A. Backer and R.C. Bakhuizen van den Brink Jr. However, the latest information on *Euphorbiaceae* of Java has not been provided since the book was published. Several additional species have been found from Java and this study aims to report additional information on *Euphorbiaceae* of Java. The study was carried out in Banten, West Java, Central Java, East Java, and Yogyakarta from March to September 2019. The result of this study shows that there is one additional genus in Java, namely *Cnidoscolus* Pohl. The genus only consists of 1 species in Java, namely *C. aconitifolius* (Mill.) I.M. Johnst. Taxonomically, the species was divided into 2 subspecies, i.e. *C. aconitifolius* subsp. *aconitifolius* and *C. aconitifolius* subsp. *polyanthus* (Pax & K.Hoffm.) Breckon. Based on the pistillate flowers shape, the specimens from Java was identified as *C. aconitifolius* subsp. *aconitifolius*. The plant is native to Northern Mexico and Mesoamerica and it was commonly cultivated in Java as vegetable crops. In Malesia, *C. aconitifolius* was previously cultivated in Brunei, Singapore, and The Philippines. Thus, its presence in Java was considered as a newly distributional record for Malesia region.

**Keywords:** Chaya; *Cnidoscolus*; *Euphorbiaceae*; Jawa; Malesia

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## INTRODUCTION

*Euphorbiaceae* is composed of 225 genera and more than 6,300 species, which are widely distributed in the world, except Arctic and Antarctica, with greatest diversity in the tropics (Webster, 1994; Govaerts, Frodin, & Radcliffe-Smith, 2000; Gray, 2011; Secco et al., 2012; Challen, 2015; Christenhusz, Fay, & Chase, 2017). There are 91 genera with 1,354 species of *Euphorbiaceae* in Malesian region (Djarwaningsih, 2017). In Java, the *Euphorbiaceae s.l.* comprises of 60 genera and 209 species (Backer & Bakhuizen van den Brink, 1963).

The taxonomical information on plant diversity in Java had been considered complete after the publication of Flora of Java vol. 1–3. The books recorded 2,067 genera with 6,100 species (Backer & Bakhuizen van den Brink, 1963; 1965; 1968). Until now, the book series are still used as the main reference for studying plant species in the Java and Madura region. This is because the Flora of Java were considered adequately representative of the existence of flora in the island (Djarwaningsih, 2010).

The updated information on *Euphorbiaceae* of Java has not been provided after the first volume of Flora of Java was published. Since then, several additional species have been reported from Java, *i.e.* *Balakata baccata* (Roxb.) Esser., *Endospermum diadenum* (Miq.) Airy Shaw, *Euphorbia graminea* Jacq., *E. hyssopifolia* L., and *Suregada glomerulata* (Blume) Baill. (Djarwaningsih, 2012; Djarwaningsih, 2013; Irsyam, Hariri, Anshori, & Irawan, 2019). The number of additional species will be increased in the future. The reports on additional species will be needed in compiling an updated information on *Euphorbiaceae* of Java. Thus, the purpose of this study is to report other additional species of *Euphorbiaceae* from Java island.

## MATERIALS & METHODS

Field study was conducted from March to September 2019 in Banten (Serpong), West Java (Bandung, Bekasi, Bogor, Sukabumi, Sumedang, Tasikmalaya), Central Java (Banyumas, Kebumen), East Java (Blitar, Malang, Probolinggo, Situbondo), and

Yogyakarta (Bantul). The field study was done using the Exploring Method (Rugayah, Retnowati, Windadri, & Hidayat, 2004). The materials used in this study were collected using van Balgooy's method (1987). The data recorded included collector names, collection number, locality, date, vernacular name, uses, and habitat. As many 19 materials were preserved, identified, and deposited in Herbarium Bandungense (FIPIA), School of Life Sciences and Technology (SITH), Institut Teknologi Bandung (ITB). Specimen examination was also carried out at Herbarium Bogoriense (BO)-LIPI Cibinong in August 2019 and the observation of living specimens was conducted in Bogor Botanical Gardens, Bogor.

The plant materials were identified using several references by McVaugh (1944), Fernández-Casas (2007), de Melo and de Sales (2008), van Welzen and Fernández-Casas (2017). The botanical terms followed Beentje (2012).

## RESULTS

### Taxonomic Treatment

*Cnidoscolus* Pohl, Pl. bras. icon. descr. 1: 56. 1827; de Melo & de Sales, Acta. Bot. Bras. 22(3) 809 2008; van Welzen & Fernández-Casas, Blumea 62: 84-86 2017.

Shrubs or trees, monoecious, with milky latex and stinging hairs. Stipules present. Leaves simple, alternate; petiole long, glandular; lamina palmatilobed to palmatipartite. Inflorescences dichasial, terminal or pseudo-axillary, unisexual. Staminate flowers: sepals 5, white, petaloid, connate; petals absent; stamens 4–30, distinct or connate in 2–6-whorled; pistillodes absent. Pistillate flowers: sepals 5, white, petaloid, distinct; petals absent; staminodes often present, filiform; pistil 3-carpellate; styles 3; stigmas 2-furcated. Fruits loculicidal and septicidal capsules. Seeds ovoid, with or without caruncle.

The genus is new to Malesia region, comprises ca. 97 species, distributed in the New World and only 1 species found in Malesia, namely *Cnidoscolus aconitifolius* (Mill.) I.M.Johnst. (McVaugh, 1944; van Welzen & Fernández-

Casas, 2017; Maya-Lastra & Steinmann, 2018).

*Cnidoscolus aconitifolius* (Mill.) I.M.Johnst., Contrib. Gray Herb., new ser.68(iii): 86 1923; Fernández-Casas, Adumbrationes 21: 3–4 2007; van Welzen & Fernández-Casas, Blumea 62: 84–86 2017; Maya-Lastra & Steinmann, Phytotaxa 346(1): 3–4 2018. — *Cnidoscolus aconitifolius* subsp. *aconitifolius* — *Jatropha aconitifolia* Miller, Gard. Dict. ed. 8 6 1768. Type: Mexico, Veracruz, 1730, W. Houston s.n. (holotype BM-000820498). — Figure 1

*Cnidoscolus chayamansa* McVaugh, Bull. Torrey Bot. Club 72: 466 1944. Type: Belize, Orange Walk: Honey Camp, coastal region, 17 September 1929, C.L. Lundell 494 (holotype US-00096482; isotypes CAS-0002041, DS, F-V0055996F, K-000254128, MO149391, NY-00246387, S).

*Cnidoscolus chaya* Lundell, Bull. Torrey Bot. Club 72: 321 1945. Type: Mexico, Yucatán: km 27, Merida–Progreso road, 30 July 1938, C.L. Lundell & A.A. Lundell 8201 (holotype LL-00042025; isotype LL-00371617, MICH-1210004).

*Jatropha deutziflora* Croizat, J. Wash. Acad. Sci. 33: 16 1943. Type: Mexico, Oaxaca: Tuxtepec, Chiltepec and vicinity, 8 August 1940, G. Martinez-Calderon 77 (holotype US-00027189; isotypes A-00047014, GH-00047015).

*Jatropha fragrans* Kunth, Nov. Gen. Sp. 2: 105 1817. — *Cnidoscolus fragrans* (Kunth) Pohl, Pl. Bras. Icon. Descr. 1: 63 1827. Type: Cuba, La Habana: Regla, A. Bonpland & F. Humboldt 1333 (holotype P-00669927; isotype P-00545646).

*Jatropha napifolia* Desr., Encycl. 4: 15 1797. — *Cnidoscolus napifolius* (Desr.) Pohl, Pl. Bras. Icon. Descr. 1: 63 1827. Type: France. Based on plants cultivated in the Jardin du Roi in Paris (original material not traced).

*Jatropha palmata* Willd., Sp. Pl. 4: 562 1805. — *Cnidoscolus palmatus* (Willd.) Pohl, Pl. Bras. Icon. Descr. 1: 63 1827. Type: Honduras, Puerto Caballos, H. Karsten 12 (holotype B-W-17922010).

*Jatropha papaya* Medik., Bot. Beob. 1782 194 1782. Type: Germany. Based on some trees grown from seed by Medikus in his Botanical

Garden [i.e. Mannheim] (original material not traced).

*Jatropha quinquelobata* Mill., Gard. Dict. ed. 8 2 1768. — *Cnidoscolus quinquelobatus* (Mill.) León, Mem. Soc. Cub. Hist. Nat. "Felipe Poey" 15: 236 1941. Type: Cuba, Without locality, 1731, W. Houston s.n. (holotype BM-000820455). Type: Cuba, Without locality, 1731, W. Houston s.n. (holotype BM-000820455).

*Jatropha urens* var. *longipedunculata* Brandege, Univ. Calif. Publ. Bot. 7: 368 1917. — *Cnidoscolus longipedunculatus* (Brandege) Pax & K.Hoffm., Pflanzenr. IV, 147, XVI: 193 1924. Type: Mexico, Veracruz: Aacuapan, 1916, C.A. Purpus 7639 (holotype UC-191126; isotypes GH-00047023, MO-159591, NY-00263494, US-00027198).

Shrub to small tree (1-A), up to 4 m high, with milky latex. *Stem* terete, with large leaf-scars; bark yellowish brown, fissured, with milky latex (1-B-C). *Branches* shiny green, white-blotched, with or without stinging hairs. *Stipules* narrowly lanceolate, 2–3 × 1 mm, apex acuminate, brown, early caducous. *Leaves* simple, alternate (1-D); petiole slender, 5.5–28 cm long, green, glabrous; lamina 3-lobed or 5–7(–9)-partited, 6–23 × 7–30 cm; dark green above (1-E), yellowish green beneath (1-F), subcoriaceous; nectary gland present at base. *Inflorescence* terminal, dichasial subumbelliform; peduncles up to 29 cm long with few short pilose hair, green; bracts and bracteolas triangular-linear. *Staminate flowers* (1-G) salverform, petaloid sepals connate, 5-lobed; tube 6–10 mm long, green; lobes obovate to orbicular, 3–4 × 4–5 mm, white, green beneath; stamens 10, 2-whorled, outer stamens 4 mm long; inner stamens 7 mm long; filaments filiform, white; anthers oblong, 1–2 × 0.5–1 mm, white, dorsibasifixed; pistillode present, filamentous, white. *Pistillate flowers* (1-H) campanulate, petaloid sepals 5, free, lobes oblong, 6–7 × 3 mm, white; disc 5-lobed, glabrous, white; ovary superior, ellipsoid, 3 mm long, trilobulate, shiny green, glabrous; style very short, ±1 mm; stigma bifurcate, white, glabrous. *Fruits* capsule, indehiscent, ovoid, 1 × 0.6 cm. *Seeds* abortive.

Distribution: Native from Northern Mexico and Mesoamerica. It was introduced to Brunei, Singapore, and The Philippines (Peregrine, 1983; Chen, Foong, Ng, Teo, & Tang, 2015; van Welzen & Fernández-Casas, 2017).

Habitat: homegardens, roadsides or open areas. Specimen examined: **BANTEN**. Desa Setu, Serpong, Tangerang Selatan, 26 September 2019, *Nuralih s.n.* (FIPIA). **WEST JAVA**. Mekarwangi, Dago Atas, Lembang, Bandung, 25 March 2019, *ASD Irsyam 221* (FIPIA); Labtek IX B Building, campus area, ITB, Bandung, 26 September 2019, *ASD Irsyam 308* (FIPIA); Jatiwaringin, Pondok Gede, Bekasi, 24 September 2019, *ASDI 307* (FIPIA); Jl. Sawah Baru, Babakan Lio, Dramaga, Bogor, 23 March 2019, *MR Hariri 21* (FIPIA); Haruman Residence, Loji, Bogor Barat, 23 March 2019, *Peniwidiyanti s.n.* (FIPIA); Kampung Benda, Desa Karang Tengah, Cibadak, Sukabumi, 31 March 2019, *ASD Irsyam 224-225* (FIPIA);

Labtek IB Building, ITB, Jatinangor, Sumedang, 25 March 2019, *ASD Irsyam 220* (FIPIA); Asrama Yavaveem, Cipedes, Tasikmalaya, March 2019, *D Andari s.n.* (FIPIA). **CENTRAL JAVA**. Karangmangu, Baturraden, Banyumas, 25 September 2019, *Peniwidiyanti s.n.* (FIPIA); Desa Mirit, Kecamatan Mirit, Kebumen, 24 September 2019, *Peniwidiyanti s.n.* (FIPIA). **EAST JAVA**. Jl. Raya Garum, Ngebra, Tawang Sari, Blitar, 05 May 2019, *Peniwidiyanti 027* (FIPIA); Jl. Raya Pakiskembar, Krajan Barat, Pakis, Malang, 03 May 2019, *Peniwidiyanti 024* (FIPIA); Jl. Raya Wandit Barat, Krajan, Mangliawan, Pakis, Malang, 03 May 2019, *Peniwidiyanti 023* (FIPIA); Jl. Wana Bhakti, Lumbang, Probolinggo, 05 May 2019, *Peniwidiyanti 026* (FIPIA); Desa Trigonco, Kecamatan Asembagus, Situbondo, 14 September 2019, *MR Hariri 49* (FIPIA). **YOGYAKARTA**. Pakem Gede village, Pakem Binangun Sub-district, Sleman Regency, 27/09/2019, *NFR 01* (FIPIA). Specimens of *Cnidoscopus aconitifolius* are not found in Herbarium Bogoriense (BO).

Etymology: The epithet *aconitifolius* means aconite-leaved (Gledhill, 2008).

Vernacular names: Pepaya jepang, chaya (Indonesia); *gedang pager* (Sunda); *kates jepang* (Jawa); Tree spinach, chaya (English).

Uses: Vegetable crops.

Notes: The species was grouped into 2 subspecies, i.e. *C. aconitifolius* subsp. *aconitifolius* and *C. aconitifolius* subsp. *polyanthus* (Pax & K.Hoffm.) Breckon. There are 1 subspecies found in Java, namely *C. aconitifolius* subsp. *aconitifolius*.

## DISCUSSION

The genus *Cnidoscopus* comprises 97 species distributed in the New World (McVaugh, 1944; de Melo & de Sales, 2008; Maya-Lastra & Steinmann, 2018). Taxonomically, Linnaeus placed the *Cnidoscopus* within *Jatropha* L. in 1753. Later, the genus was regarded as distinct genus by Pohl in 1827, based on morphological characters. *Cnidoscopus* has stinging hairs, nectary glands at the apex of petiole, and white petaloid sepals which are absent in *Jatropha* (McVaugh, 1944; Miller & Webster, 1962; de Melo & de Sales, 2008; van Welzen & Fernández-Casas, 2017).

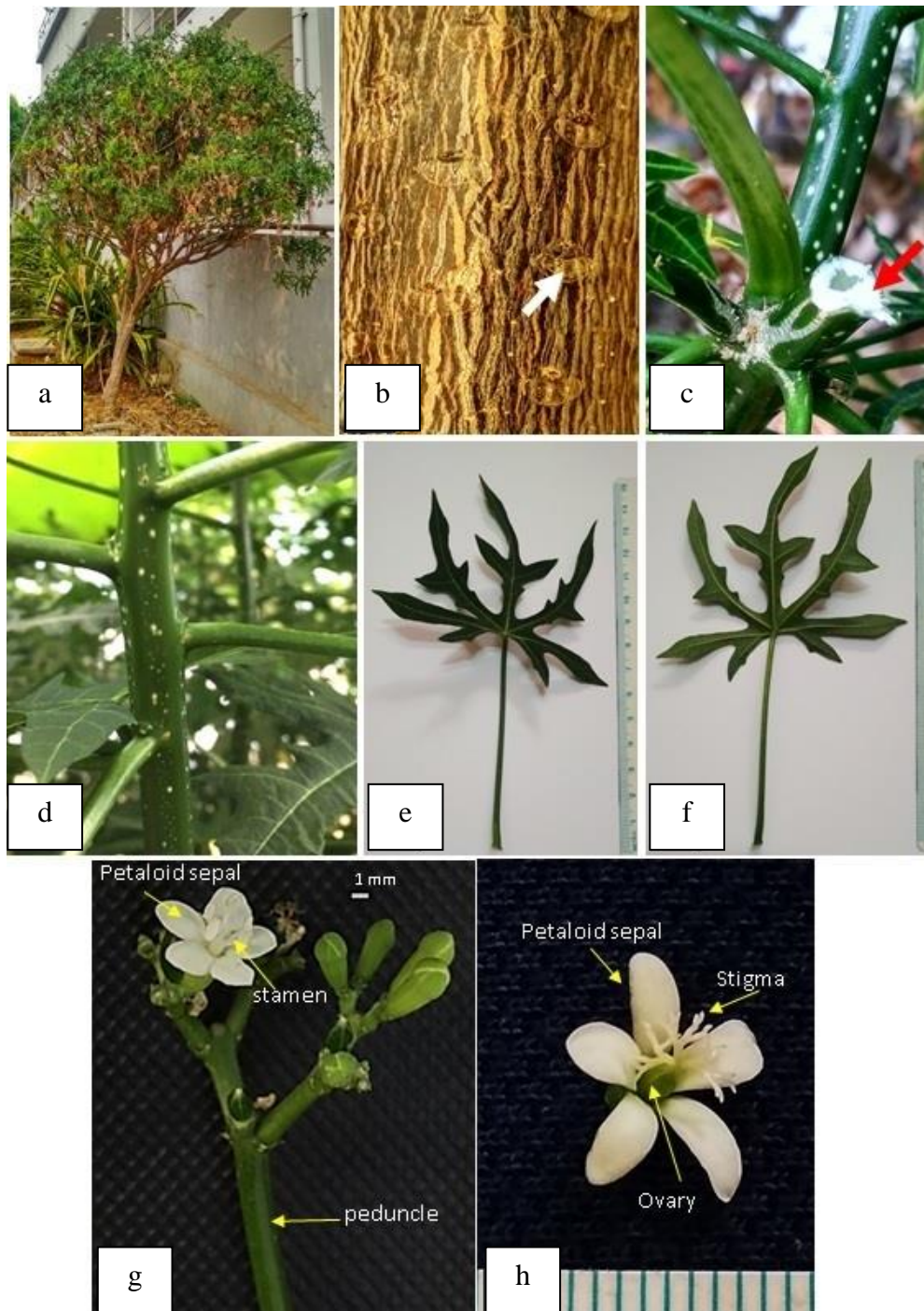
The presence of the genus *Cnidoscopus* Pohl in Java has not been recorded by Backer and Bakhuizen van den Brink in the Flora of Java (Backer & Bakhuizen van den Brink, 1963). The recent field study shows that the genus consists of only one species in Java. According to Fernández-Casas (2007) and Maya-Lastra and Steinmann (2018), the specimens collected from Java were identified as *C. aconitifolius* (Mill.) I.M.Johnst.

In 1984, Breckon divided *Cnidoscopus aconitifolius* into 2 subspecies, i.e. *C. aconitifolius* subsp. *aconitifolius* and *C. aconitifolius* subsp. *polyanthus* (Pax & K.Hoffm.) Breckon (Fernández-Casas, 2007). *C. aconitifolius* subsp. *aconitifolius* distributed from Northern Mexico to Guatemala and *C. aconitifolius* subsp. *polyanthus* native to Michoacán, the small area in South-Western Mexico (Kolterman, Breckon, & Kowal, 1984; Fernández-Casas, 2007). Morphologically, *C. aconitifolius* subsp. *aconitifolius* has campanulate pistillate flowers. Meanwhile, the shape of pistillate flowers of *C. aconitifolius* subsp. *polyanthus* are salverform (Fernández-Casas, 2007). Based on this character, all materials collected from Java were identified as *C. aconitifolius* subsp. *aconitifolius* due to

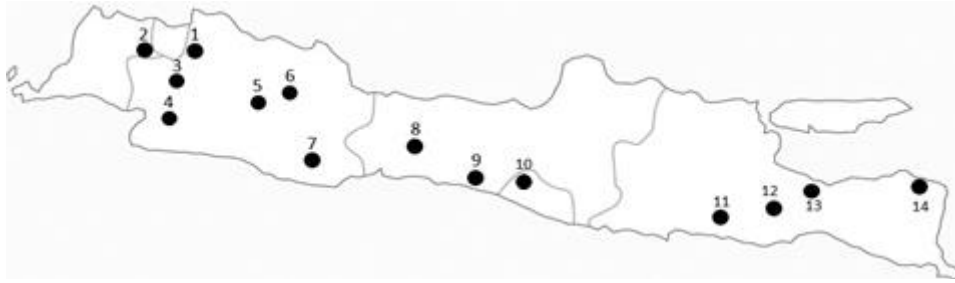
their campanulate pistillate flowers (Figure 1-H).

*Cnidoscolus aconitifolius* was collected from 14 locations in Banten (Serpong), West Java (Bandung, Bekasi, Bogor, Sumedang, Tasikmalaya, Sukabumi), Central Java (Banyumas, Kebumen), East Java (Blitar, Malang, Probolinggo, Situbondo), and Yogyakarta (Bantul). *Cnidoscolus aconitifolius* is considered to enter Java via the trade of

cultivation route. There was no information when 'chaya' appeared for the first time in Java. However, the species might be introduced after the Flora of Java was published in 1963. As a cultivated plant, *Cnidoscolus aconitifolius* may still be present in other locations. Figure 2 shows the distribution of the species in Java.

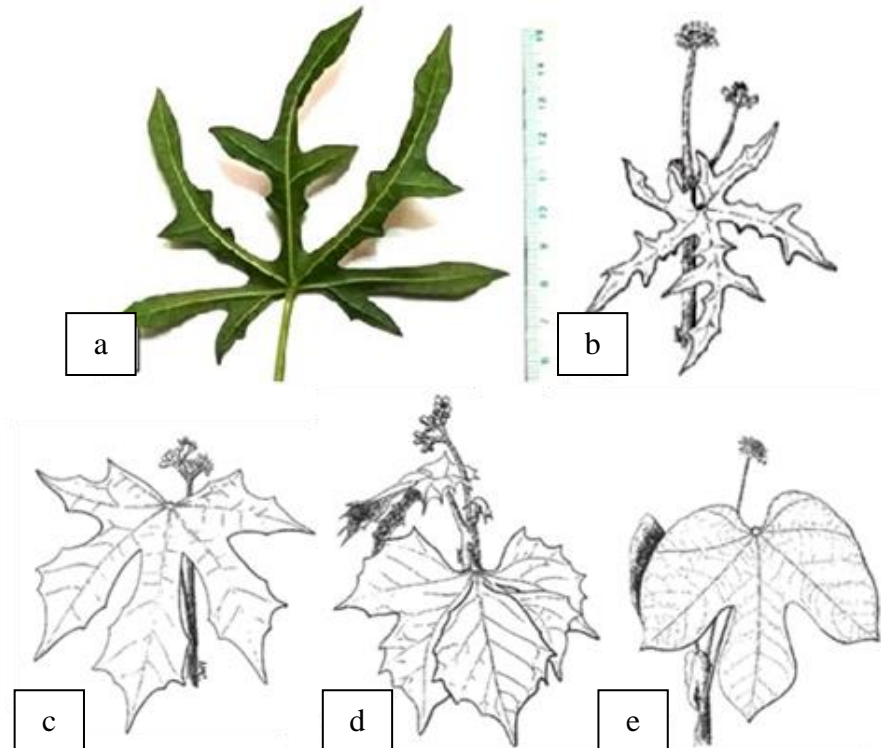


**Figure 1.** Morphological characters of *Cnidoscolus aconitifolius* subsp. *aconitifolius* (a) habit, (b) stem with large leaf-scars (arrow) and fissured bark, (c) milky latex (arrow), (d) alternate arranged leaves, (e) adaxial leaf surface, (f) abaxial leaf surface, (g) inflorescence with staminate flowers, (h) pistillate flower



**Figure 2.** Distribution map of *Cnidoscolus aconitifolius* in Java. (1) Bekasi, (2) Serpong, (3) Bogor, (4) Sukabumi, (5) Bandung, (6) Sumedang, (7) Tasikmalaya, (8) Banyumas, (9) Kebumen, (10) Bantul, (11) Blitar, (12) Malang, (13) Probolinggo, (14) Asembagus-Situbondo

*Cnidoscolus aconitifolius* subsp. *aconitifolius* was grouped into four cultivars, namely ‘Estrella’, ‘Picuda’, ‘Chayamansa’, and ‘Redonda’ (Ross-Ibarra & Molina-Cruz, 2002; Ross-Ibarra, 2003). The cultivar ‘Estrella’ has five spreading, non-overlapping leaf lobes with dentate margin, whereas the ‘Picuda’ has five to nine narrowly lobes and strongly dentate to pinnatifid. The cultivar ‘Chayamansa’ was characterized by five obovate lobes, and usually overlapping to the central three lobes. The latest cultivar, ‘Redonda’, has three lobes with entire to slightly dentate margins and lacking in stinging hairs (Ross-Ibarra & Molina-Cruz, 2002). In this study, we do not identified the specimens from Java as *C. aconitifolius* subsp. *aconitifolius* ‘Chayamansa’. According to McVaugh (1944), van Welzen and Fernández-Casas (2017), the cultivar ‘Chayamansa’ has ovate leaf lobes and overlapping each other. Morphologically, the specimens from Java quite similar to cultivar ‘Picuda’, due to their five to nine narrowly lobes (Figure 3A).



**Figure 3.** Leaves of the 4 cultivars of *C. aconitifolius* (a) the leaf of *C. aconitifolius* in this study, (b) the leaf of cultivar ‘Picuda’, (c) the leaf of ‘Estrella’, (d) the leaves of ‘Chayamansa’, (e) the leaf of ‘Redonda’ (Ross-Ibarra & Molina-Cruz, 2002)

Naturally, the wild type of *Cnidoscolus aconitifolius* was armed by stinging trichomes on its trunk, branches, and leaves (Ross-Ibarra & Molina-Cruz, 2002). The glandular trichome

consists of a multicellular elongate cells with a swollen tip. These trichomes produce serotonin, a stinging compound, to against herbivores. When a herbivore rushed against

*Cnidoscolus aconitifolius*, the tip of hairs will be broken, penetrates the skin, and serotonins are expelled. Later, serotonin stimulates inflammation to the animal. The stinging trichomes are lacking in the cultivated one (Lookadoo & Pollard, 1991; Ross-Ibarra & Molina-Cruz, 2002; Abdala-Roberts & Parra-Tabla, 2005). However, *Cnidoscolus aconitifolius* collected from Sukabumi (West

Java) and Malang (East Java) still have stinging trichomes on their branches and petioles, although just in small amounts (Figure 4). The previous study showed that artificial defoliation induces trichome production in leaves and petioles of *Cnidoscolus aconitifolius* (Abdala-Roberts & Parra-Tabla, 2005).



**Figure 4.** The stinging hairs on the petiole of ASDI 224 specimen (Sukabumi, West Java)

All the *Cnidoscolus aconitifolius* collected from Java produces abortive seeds and the same case was also reported in the Philippines (van Welzen & Fernández-Casas, 2017). That is because the cultivated form has sterile staminate flowers. Therefore, *Cnidoscolus aconitifolius* is propagated vegetatively through cuttings and stem fragmentation (Peregrine, 1983; Ross-Ibarra & Molina-Cruz, 2002). Although vegetatively propagated, the plant was escaped from cultivation near Cebu City in the Philippines (van Welzen & Fernández-Casas, 2017). But, van Welzen & Fernández-Casas (2017) noted that the escaped population would not appear to be invasive.

*Cnidoscolus aconitifolius* is widely brought from Central America to other regions as vegetable crops (Ross-Ibarra & Molina-Cruz, 2002) and became a popular vegetable in Java. Many people plant this species in their garden or yard. More importantly, it has also being sold on several traditional markets in Bogor and Serpong with at a price of five thousand rupiah for two bundles (Figure 5). The young leaves of *Cnidoscolus aconitifolius* are traditionally consumed as *lalaban* or *pecel* and can be processed into several local culinary such as *rendang*, *buntil*, *opor*, *rolade*, or a mixture of pudding and drinks. In Tasikmalaya, the leaves were also used as a

natural green food coloring by squeezing it (Sudartini, Rumiati, & Suhartono, 2016).

Chemically, the leaves had high contents of vitamins A, vitamins C, b-carotene, protein, calcium, phosphorus, iron, thiamin, riboflavin, and niacin (Peregrine, 1983; Kuti & Kuti, 1999; Ross-Ibarra & Molina-Cruz, 2002; Blancke, 2016). In addition, the other phytochemical constituent extracted from *Cnidoscolus aconitifolius* were flavonoids, stearic acid, oleic acid, palmitic acid, acyclic diterpene alcohol, linoleic acid ester, pyrrolidone, ketone, and palmitic acid ester (González-Laredo, de la Hoya, Quintero-Ramos, & Karchesy, 2003; Omotosho, Olorunfemi, & Mikailu, 2014). Besides those beneficial compounds, the raw leaves contain cyanogenic glycoside that toxic to animals and humans (González-Laredo et al., 2003; Kuti & Konoru, 2006). Therefore, it should be cooked or boiled to hydrolyze the compound and reduce the risk of poisoning (Kuti & Konoru, 2006; Morais et al., 2016; Moura et al., 2019).

*Euphorbiaceae* are important medicinal plants in the world and *Cnidoscolus aconitifolius* has been also used as traditional medicine (Ross-Ibarra & Molina-Cruz, 2002; Mwine & Damme, 2011; Moura et al., 2019). In Mexico, *Cnidoscolus aconitifolius* leaves tea is commonly used to treat diabetes, kidney stones, obesity, and malnutrition (Ross-Ibarra & Molina-Cruz, 2002; Blancke, 2016;

Sanchez-Hernandez, Barragan-Alvarez, Torres-Gonzalez, & Padilla-Camberos, 2017). The species has been also used therapeutically as alcoholism medication, anti-cholesterol, antiinsomnia, antiarthritic, antiarteriosclerosis, scorpion sting antidote, strengthens nails, cleanses the cardiovascular system, lactagogue, and stimulants for digestion, brain and vision (Miranda et al., 2010; Adaramoye, Aluko, & Oyagbemi, 2011; Poot-Lopez, Gasca-Leyva, & Olvera-Novoa, 2012; Sanchez-Hernandez et al., 2017; Moura et al., 2019).

The previous pharmacological studies showed that leaves extract of *Cnidoscolus aconitifolius* has antiprotozoal,

antimycobacterial antimutagenic, antidiabetic, antiinflammatory, cardioprotective, hepatoprotective, and antioxidant activities (Loarca-Piña, Mendoza, Ramos-Gómez, & Reynoso, 2010; García-Rodríguez et al., 2014; Kuri-García, Chávez-Servín, & Guzmán-Maldonado, 2017; Pérez-González et al., 2017; Pérez-González et al., 2018). The leaves extract also caused increased death of HT-29 cells or colon carcinoma cells (Kumarasamy, Nallaperumal, Natarajan, & Nallamadan, 2014). Based on these studies, *C. aconitifolius* possible to be promoted as a medicinal plant in Indonesia.



**Figure 5.** The leaves of *Cnidoscolus aconitifolius* (arrows) has been sold as vegetable at Pasar Bogor, in front of Bogor Botanic Gardens, West Java

## CONCLUSION

The genus *Cnidoscolus* is a new record for Java, Indonesia. It only comprises of one subspecies in Java, namely *Cnidoscolus aconitifolius* (Mill.) I.M.Johnst. The genus and species have not been recorded before in the Flora of Java. This species was introduced from Central America and it is widely cultivated as vegetables due to their edible leaves. The presence of *Cnidoscolus aconitifolius* in Java would be a new distributional record for Flora Malesiana. The species has been traditionally used as medicine in Mexico. Meanwhile, pharmacological studies revealed some activities of *Cnidoscolus aconitifolius* leaves extract as antiprotozoal, antimycobacterial, antimutagenic, antitumor, antidiabetic, antiinflammatory, cardioprotective, hepatoprotective, and antioxidant. Thus, the species possible to be promoted as a medicinal plant in Indonesia.

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