



Durio gerikensis (Malvaceae), a new Arilless *Durio* from Hulu Perak, Malaysia

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Abstract

A new species *Durio gerikensis* (Malvaceae) is described from Hulu Perak, Peninsular Malaysia, it can be easily recognised in the field by its reddish-pink flowers and small (6–7.5 cm in diameter), golden yellowish to pale yellow fruits with persistent calyx. It is unique from all the congeneric taxa by having two to four valved fruits with arilless seeds. Morphologically, *Durio gerikensis* is similar to *D. lanceolatus* Mast. (Masters 1875:499) and *D. singaporensis* Ridl. (Ridley 1916: 143) but they differ in their leaf, flower and fruit characteristics.

Keywords: arilless *Durio*, red-pink flowers, persistent calyx, Peninsular Malaysia

Introduction

The genus *Durio* Adans. (Adansons 1763: 581) is native to South East Asia and has a centre of diversity on the island of Borneo (Kostermans 1958, Salma 2011). The genus is classified under the subfamily Helicteroideae Meisn. within the family Malvaceae Juss. (Nyffeler & Baum 2001, Stevens 2001). Previously the genus was separated into two subgenera, or sections, namely *Boschia* Korth. (Korthals 1842: 257) and *Durio* (Kostermans 1958, POWO 2019). Later, the resurrection of *Boschia* as a genus under Malvaceae was supported by Nyffeler & Baum (2001) based on morphology (anther architecture) and molecular evidence. Currently, twenty-four *Durio* species are recognised in Malaysia, eight species in Sumatra, and one species each in Myanmar (Burma) and Sri Lanka (Abang Mohd Mokhtar 1991, Cockburn 1976, Kostermans 1958, Mansur 2007, Salma 2011). Although *Durio zibethinus* (locally known as durian in Malaysia) are synonymous with their popularity as ‘the king of fruits’ for their usually starchy flesh, only

nine species—*D. dulcis* Becc. (Beccari 1889: 243), *D. graveolens* Becc. (Beccari 1889: 242), *D. grandiflorus* (Mast.) (Masters 1875:502), Kosterm. & Soegeng (Kostermans & Wertit 1958: 10), *D. kutejensis* (Hasskarl 1858:100) Becc. (Beccari 1889: 251), *D. lowianus* Scort. ex King (Scortechini 1891: 51), *D. oblongus* Mast. (Masters 1875: 500), *D. oxleyanus* Griff. (Griffith 1845: 115), *D. testudinarius* Becc. (Beccari 1889:244) and *D. zibethinus* Murr. (Murray 1774: 581)—produce edible fruits, the remaining species produce either extremely unpalatable (inedible) or arilless fruits (Soegeng 1962, Nyffeler & Baum 2001, Salma 2011).

In June 2020, we encountered a durian tree that produced red flowers and had fruits that were inedible (arilless) in Gerik, Perak. Based on the floral characteristics summarised by Nyffeler & Baum (2001), only *Durio kutejensis*, *D. dulcis*, *D. pinangianus* Becc. (Beccari 1889: 246) Ridl. (Ridley 1922: 264), *D. johoricus* Salma (Salma 2015: 421) and *D. lowianus* produces red inflorescences in Malaysia. Initially, we collected only fruit and leaf samples in 2020, and identified the tree as *D. singaporensis* due to its arilless fruits but our further consultation of the *Durio* specimens housed at MDI and KEP herbaria, the analysis we have made was not agreeing with *D. singaporensis*. We then arranged a second visit in April 2021, wherein we have observed that the tree produced red flowers. Based on this combination of distinct features (red flowers and arilless fruits), we confirmed the specimen is distinct from *D. lowianus*, *D. kutejensis* or *D. singaporensis*, and hitherto undiscovered. During the same field trip, a second tree was collected from Lata Kekabu FR, Lenggong which bore fruits with matching characteristics, the tree is larger compared to the Gerik, Perak collection.

Material and Methods

The morphology of *Durio gerikensis* was determined based on fresh samples observed *in situ* and from the herbarium specimens (MDI12456, MDI12459) deposited at MARDI (MyGenebank™ Complex MARDI Serdang). Specimens for *D. lanceolatus* and *D. singaporensis* were also observed for comparison and their details were provided in additional specimens examined.

For micromorphology study, leaf epidermis preparative fragments about 3 mm long were excised from the middle portion of three matured leaves of each species. Cuticle parts were prepared by soaking leaf blade fragments in 5–10% aqueous chromium trioxide until all organic material except the cuticle was dissolved. Targeted leaf cuticles were mounted on aluminium stubs with double-sided adhesive tape and air dried. The stubs were then sputter-coated with pure gold to a maximum thickness of 15 nm and examined with LEO (Model 1450 SEM)—Field Emission Scanning Electron Microscope (FESEM). The remaining cuticles were soaked in 5% ammonia and mounted on microscope slides in Canada balsam. Results of the adaxial and abaxial epidermal layers under scanning electron microscope (SEM) for *D. gerikensis* are showed in Figure 4.

Taxonomic treatment

Durio gerikensis M.N.Faizal, Edward, Latiff & Hadrul, *sp. nov.* (Figs 1, 2, 3, 5 & 6)

Diagnosis:—*Durio gerikensis* morphology is partially similar to *D. lanceolatus*. It has oblong-lanceolate leaves (vs. elliptic-lanceolate to ovate), base acute (vs. acute to round); flowers in 6–28 flowered cymes, on young to older branches, reddish pink petals (vs. 3–4 flowered cymes, on older branches, yellow petals); and its fruit is arilless, not edible and contains two to four valves (vs. creamy aril, almost tasteless and unpalatable). When compared to *D. singaporensis* fruits (another species with arilless fruits) it has 5-lobed, white leathery aril which later dried and not edible. Additionally, *D. gerikensis* fruits can be readily differentiated from both *D. lanceolatus* and *D. singaporensis* with the persistent calyx on the mature fruits and the four-valved fruits (vs. early caducous calyx and more than 4-valved fruits).

Type:—PENINSULAR MALAYSIA, Perak, Gerik, 29th July 2020, N 5° 24.77906; E 101° 1795603, Mohd. Norfaizal, Hadrul, Muhamad Ikhwan, Edward Entalai, Mohd Masri MDI12456 [holotype MDI; isotype KEP].

Description:—A tree of medium to big size, ca. 40 m tall, 1.7–2.3 m in diameter, vigour high; main trunk 2.5–3.24 m in height; canopy shape oval-irregular, branching density medium to dense, branching pattern semi-erect; bark rough, faintly lenticellate, greyish to light brown. Leaf petiole 1.3–1.5 cm long, terete. Leaves oblong-lanceolate, 9.3–11.6 × 2.7–4.1 cm, thin leathery, apex acute, acumen 4–(7)–9 mm long, base rounded, margin undulate, upper surface dark green, glabrous with sparse simple, unicellular trichomes, with sparse, slightly dull, lower surface slight golden-green, densely covered with layers of dentate-lepidote scales, simple peltate scale and 5–20-armed stellate

trichomes with a central cushion, midribs channelled above, pointed below in triangle shape, lateral veins 17–19 pairs, conspicuous on upper surface, inconspicuous on lower surface. Inflorescences composed of 6–28-flowered fasciculate cymes, observed on young and old branches and twigs. Flower bud ovoid to globose, apex rounded, 1.4–1.65 × 1.3–1.45 cm, peduncle 1.4–1.7 cm long. Pedicel terete, 2.4–3.4 cm long. Epicalyx 2–3-lobed, lobes ovate to subovate, 1.5–1.8 × 2 cm, apex rounded, green to brownish golden, densely stellate with simple, unicellular hairy inside, brown, rough scaly outside. Calyx 5-lobed, lobes 0.3–0.55 × 0.7–0.8 cm, golden brown, glabrous to sparsely hairy inside, green to yellow, rough, scaly outside. Petals 4–5, pink to light pink, spatulate, 2.1–2.7 × 0.7–1.2 cm, with minute hairs outside. Stamens arranged in 5–7 phalanges, each phalanx branched at 6–7 mm with 4–7, pink or cream to golden-brown, 2–3.5 cm long, unequal, sparsely glabrous to stellate hairy filaments; anthers reniform, in a cluster of 5–8, dehiscent by slits, yellowish to golden-brown. Ovary ellipsoid to sub-ovoid, densely covered with appressed, golden scales, 7–8.5 × 4–6 mm; style ca. 22 mm long, erect, covered with stellate hairs at distal and proximal ends; stigma globose to capitate, yellow to brownish-golden. Fruit dry, globose, 6.1–7.5 × 5.2–6.1 cm, dehiscent (dehisce before drooping) capsules with persistent calyx, epicarp spinulate, green to golden-yellowish, apex blunt or slightly pointed on the beak, stalk 1.3–1.7 cm long, two- to four-valved (usually three), each valve with only single arilless seed. Seed ovoid, 3.8–4.5 × 3.1–3.8 cm, brown.

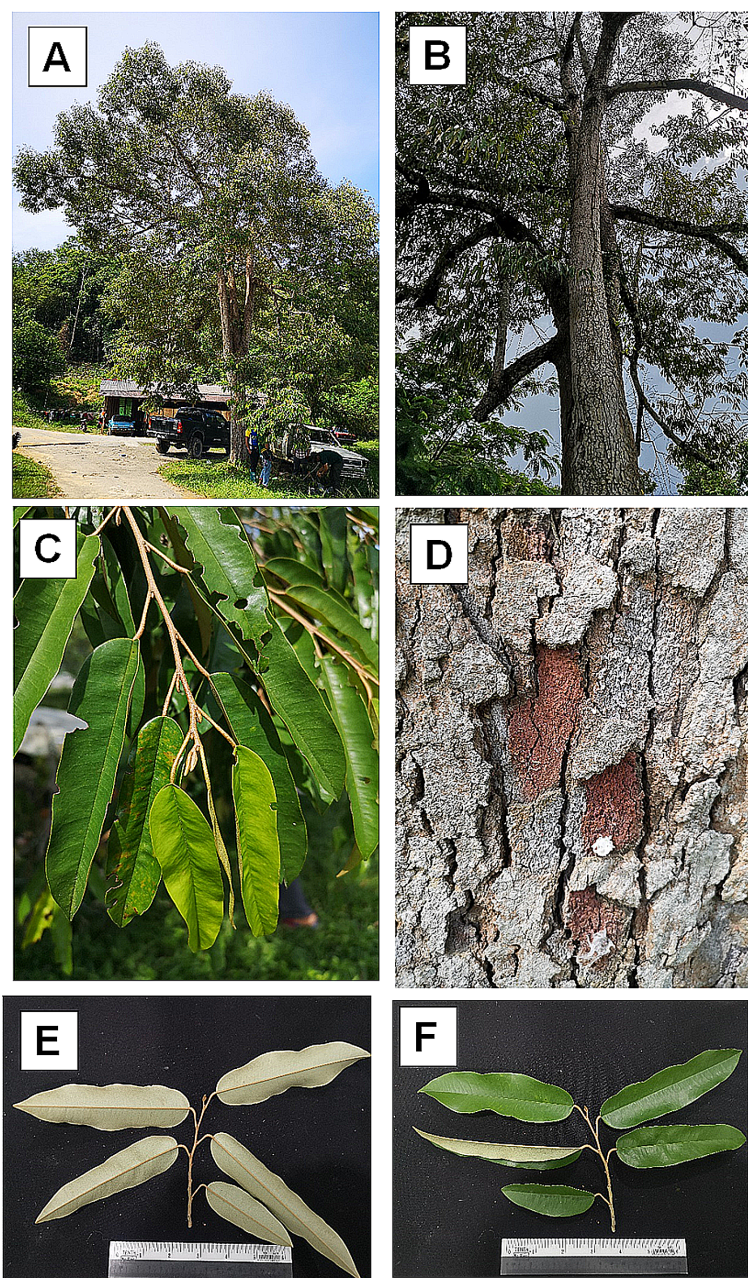


FIGURE 1. *Durio gerikensis* A) tree (habit) at the type locality. B) branching pattern. C) leaves. D) bark. E) abaxial surface of the leaves. F) adaxial surface of the leaves. Photographs (A) by Mohd Masri Saranum; (B–F) by Mohd Norfaizal Ghazalli.

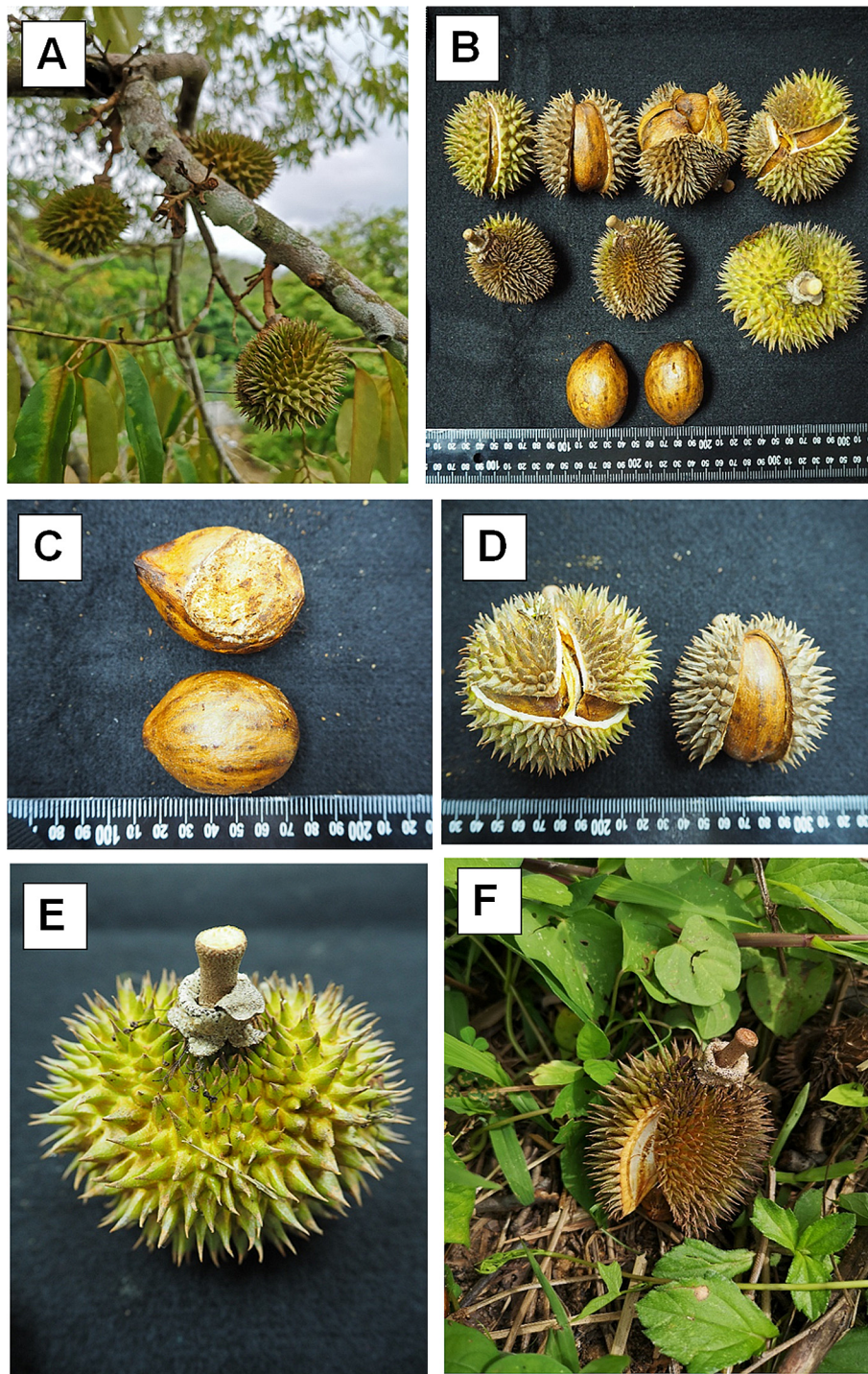


FIGURE 2. *Durio gerikensis* A) fruiting leafy twig. B) different fruit stages, and arilless seeds. C) arilless seeds (close up). D) dehiscid fruits with three lobes (left) and one lobe (right). (E) immature fruit (F) mature and dehiscid fruit with persistent calyx. Photographs A–F by Mohd Norfaizal Ghazalli.

Distribution and habitat:—*Durio gerikensis* has been found in two adjacent locations (Lenggong and Gerik) in the district of Hulu Perak, Perak, Peninsular Malaysia. The species grows in a mixed dipterocarp forest, near Orang Asli (Malayan aborigines) settlements; and associated with *Artocarpus elasticus* Reinw. ex Blume (Reinwardt 1825: 481), *A. rigidus* Blume (Blume 1825: 482), *Pentaspadon motleyi* Hook.f. (Hooker 1860: 168), *Durio zibethinus* (Murray 1774: 581), *Uvaria grandiflora* Roxb. ex Hornem. (Roxburgh 1832: 665), *Lithocarpus elegans* (Blume 1825:208) Hatus. ex Soepadmo (Soepadmo 1970: 236). Presently known only from these two individuals in situ observation in Hulu Perak and extant population of this species is still under evaluation. We propose that this species status as Critically Endangered (CR) species, which is evaluated as facing an extremely high risk of extinction in the wild with

only a few individuals observed in the forest. For *ex situ* conservation, we successfully germinated twenty (20) seeds and it is intended for field gene bank conservation program in Malaysian Agricultural Research and Development Institute (MARDI), as well as for distribution to other existing botanical gardens or parks in Malaysia. We also advise the Forestry Department of Peninsular Malaysia in which those localities observed to protect the living specimens for future references.

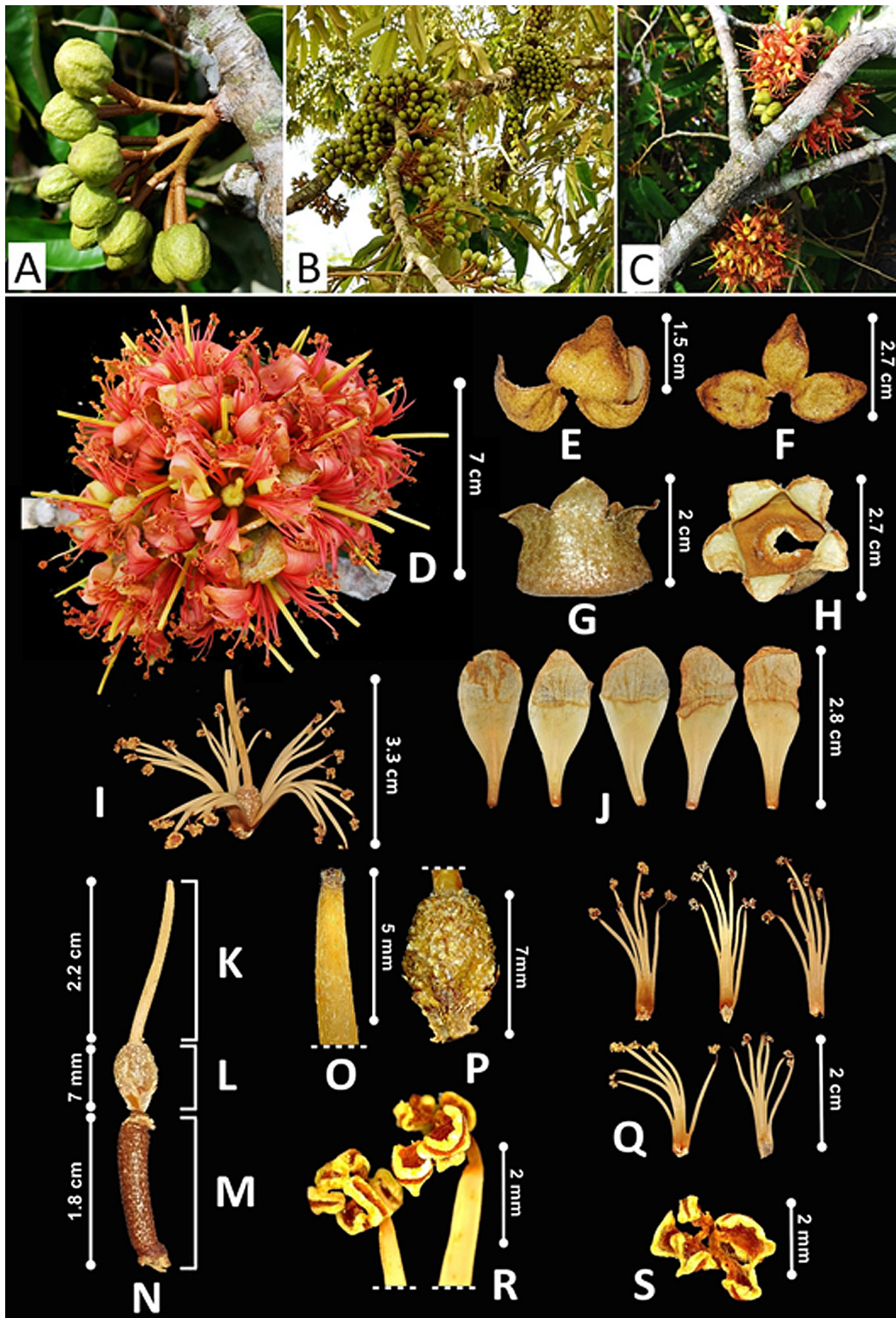


FIGURE 3. *Durio gerikensis* A) inflorescence young flower buds. B) inflorescences flower buds on branches. C) inflorescences on branch. D) flowers in fasciculate cymes. E) epicalyx. F) opened epicalyx. G) calyx. H) calyx adaxial view. I) stamens in 5 phalanges. J) petals. K–L) pistil (ovary, style and stigma) and pedicel. N) full part of the pistil and pedicel. O) portion of style and stigma at the end of style. P) ovary. Q) phalanges of stamens. R) close up of stamens. S) dehisced anthers. Photographs A–C by Mohd Norfaizal Ghazalli; D–S by Edward Entalai Besi.

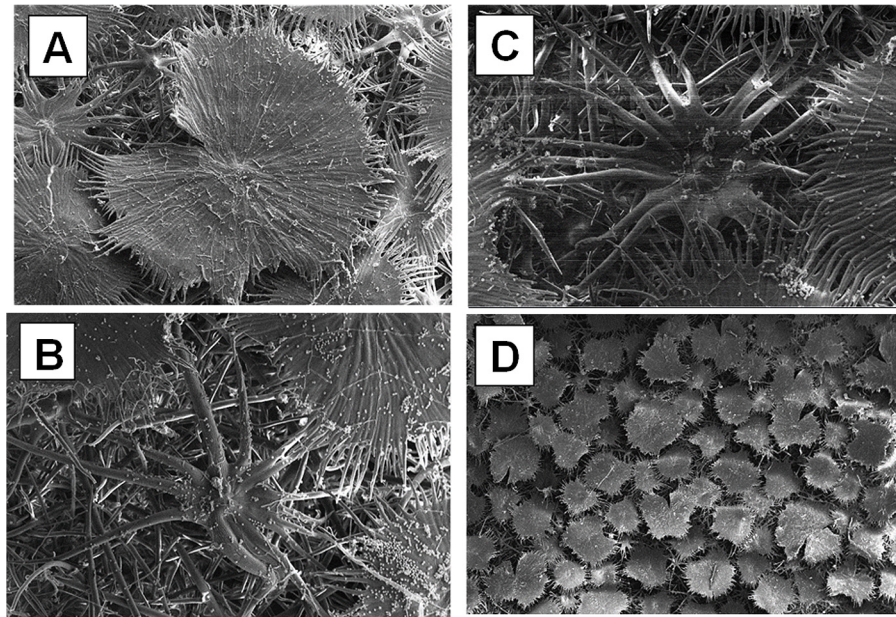


FIGURE 4. *Durio gerikensis*: the micromorphology of leaf surfaces of viewed using the scanning electron microscope. A–C) adaxial surface and D) abaxial surface. A) dentate-lepidote trichome. B) 18–20-armed stellate trichomes (centre) and dentate-lepidote scales (left and right). C) 5-armed stellate trichomes with a central cushion. D) densely covered with dentate-lepidote scales above and stellate trichomes was found in between and underneath the scales. Images A–D by Ahmad Zaki Zaini & Mohd Norfaizal Ghazalli.

Phenology:—Flowering in April to May, fruiting in July to early August.

Etymology:—Named after the type locality, Gerik, Hulu Perak, Peninsular Malaysia.

Notes:—*Durio gerikensis* also shares the similarities with *D. lanceolatus* in oblong-lanceolate or elliptic-lanceolate leaves with acute to rounded base, and *D. singaporensis* in having arilless seeds and more than 4-valved fruit. But *D. gerikensis* differs from latter two by having different morphological characters (Table 1).

TABLE 1. Key morphological comparison of *Durio gerikensis*, *D. lanceolatus* and *D. singaporensis*.

Characters	<i>D. gerikensis</i> sp. nov.	<i>D. lanceolatus</i>	<i>D. singaporensis</i>
Aril	Absent	Present	Present
Colour of mature fruit	Golden-yellow	Orange	Greenish-yellow
Leaf	Thin, oblong-lanceolate, apex acute and base rounded	Leathery, elliptic-lanceolate, apex acuminate, base acute	Leathery, oblong, apex acuminate, base obtuse
Flower bud	Ovoid to round	Ellipsoid	Ovoid
Inflorescence	6–28 flowered cymes, on young and old branches	3–4 flowered cymes, on older branches	2–4 flowered cymes borne on bosses of branches
Flower	Without fragrance	Fragrance	Without fragrance
Petals	4–5; pink to light pink, spatulate	5, yellow, spatulate	5, white, oblong
Number of fruit valves	Four valves, split on the tree before dropping	Up to five valves, split on the tree before dropping	5 valves, fruit split on the tree before dropping
Number seeds per valve	One	Up to five	Up to four
Calyx on mature fruit	Persistent	Caducous	Caducous

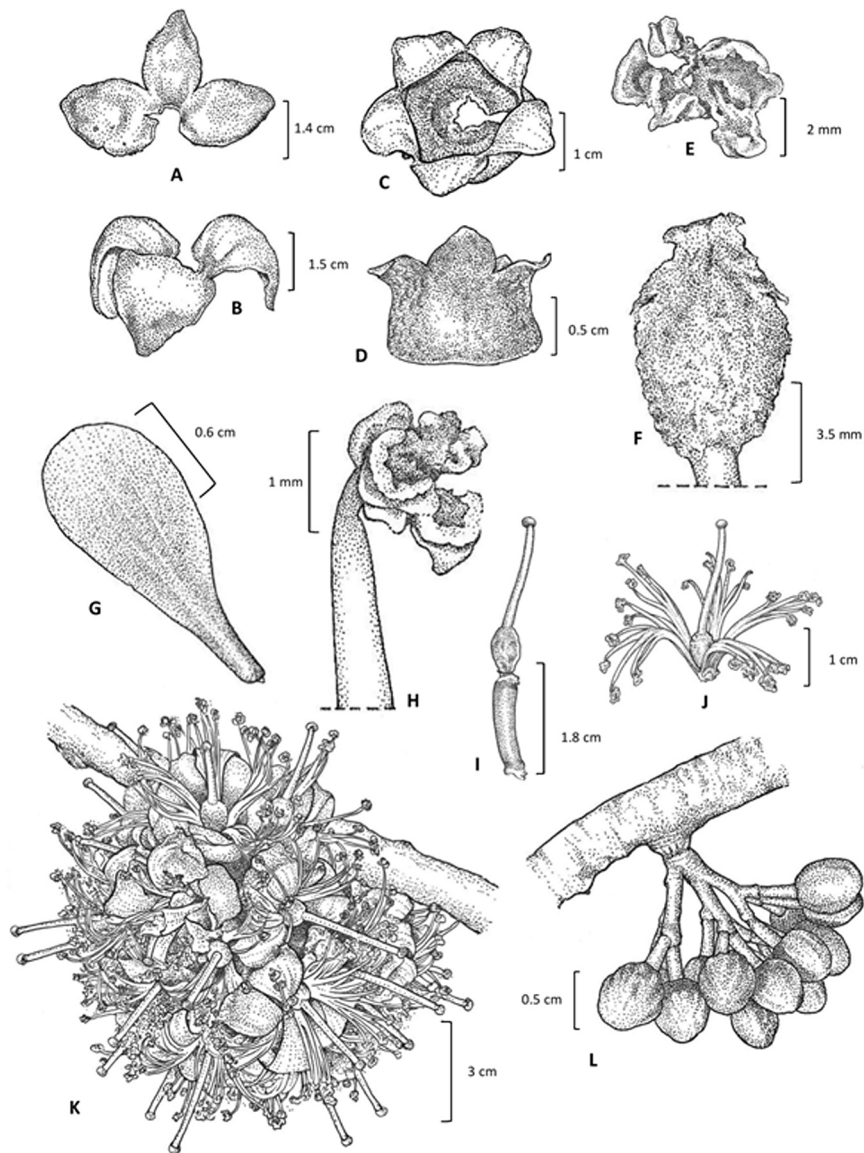


FIGURE 5. *Durio gerikensis* A) opened epicalyx. B) intact epicalyx. C) calyx adaxial view. D) calyx. E) stamen. F) ovary. G) petal. H) anther. I) pistil and pedicel. J) phalanges of stamen. K) inflorescence. L) flower bud. Illustrated by Zulkifli Zainol Alam.

Additional specimen examined:—*Durio gerikensis*: PENINSULAR MALAYSIA, Perak, Lata Lawin FR, Lenggong, 29th July 2020, Mohd Norfaizal, Hadrul, Muhamad Ikhwan, Edward Entalai, Mohd Masri MDI12459 (MDI). ***Durio lanceolatus*:** BORNEO-SABAH: Beaufort Hill, SAN 36983 (SAN); Ranau, SAN 128833 (SAN); 1 mile North-east of Beaufort, SAN 15060 (KEP); Tawau, Elphinstone, SAN 21779 (SING).—SARAWAK: Bukit Raya, Kapit, S22284 (SAR); Gunung Buri, 25th Mile, 1st/2nd Div. boundary, S36993 (SAR); Ng. Mengiong, Ulu Balleh Kapit, 3rd Division Mixed dipterocarp forest on ridge at 1000ft altitude, S29180 (SING); Lundu, Gunung Ending, path to summit from waterfall, lowland dipterocarp forest, SAN 15373 (SING); Syarikat Salmas, Sampadi, F.R. Lundu, 1st Division, S37805 (KEP; SAR); Gunung Buri, 75th mile, 1st Division, S36933 (SAR); Ulu Ropan, Belalong watershed, S5265 (KEP); Ulu Ropan, S5253 (SAR); Gunung Buri 7th mile, 1st/2nd division boundary, S36933 (KEP); Ng. Mengiong, Ulu Balleh, Kapit, 3rd division, S29180 (KEP).—BRUNEI: Ulu Ropan-Belulong watershed, BRUN 5652 (KEP), Pseudagan FR, BRUN 80159 (KEP). ***Durio singaporensis* Ridl.:** PENINSULAR MALAYSIA-TERENGGANU: Sg. Terengganu near Kuala Kerbat, Kuala Lasir, FRI 20236 (KEP); Kemaman, low ridge North-west from Pengkalan Kajang, FRI 20187 (KEP); Terengganu hills, Sg. Terengganu, near Kuala Kerbat South of Kuala Lasir, FRI 20236 (KEP); Jerangau, Dungun, KEP 80808 (SING); Ulu Sg. Terengganu, Ulu Terengganu, KEP 8462 (KEP); Ulu Sg.

Terengganu, Kuala Penang, Ulu Terengganu, FRI 8462 (SAR); Sg. Terengganu, Kemaman, Pengkalan Kajang, FRI 20817 (SAR).—PAHANG: Lesong FR, FRI 28362 (KEP); Pancing Forest, 15 km north to Pancing, Kuantan, KEP 10466 (KEP); Eastern edge of Chini FR, South of Tasik China, FRI 17287 (KEP); Eastern edge of Chini FR, South of Tasek Chini, FRI 17287 (SING); Lesong FR, FRI 19839 (KEP); G. Tapis, FRI 10928 (SAR); Lesong FR, Pahang, FRI 8656 (SAR); Eastern edge of Chini FR, South of Tasik Chini, FRI 17287 (SAR); Ridge to G. Tapis, FRI 10928 (SAR); Bt. Kajang FR, FRI 45499 (KEP).—NEGERI SEMBILAN: Gunung Angsi FR KEP23695 (KEP).—JOHOR: Sg. Kayu, Mawai, Jemaluang Road KEP 29257 (KEP); Sg. Sedeli, KEP 36974 (KEP), Gunung Janing, Labis FR, Ulu Endau, KEP 110407 (KEP), Gunung Berlumut, FRI 8780 (SING); N.E. Johor, lenggor FR Hillside, at. 500', FRI8656 (SING), Sungai Sedili below Mawai, KEP 36974 (SING); S. Kayu, Mawai, Jemaluang road, Field No. 29257 (SING); Kluang FR Hillside, FRI 7534 (KEP), Gunung Berlumut, FRI8780 (KEP); Renggam FR, Johor, FRI 2185 (KEP); Road to Sg. Kahang, North to Labis FR FRI 17789 (SAR); Kuala Kemaman HS Labis, W.D.F., FRI 34152 (KEP).

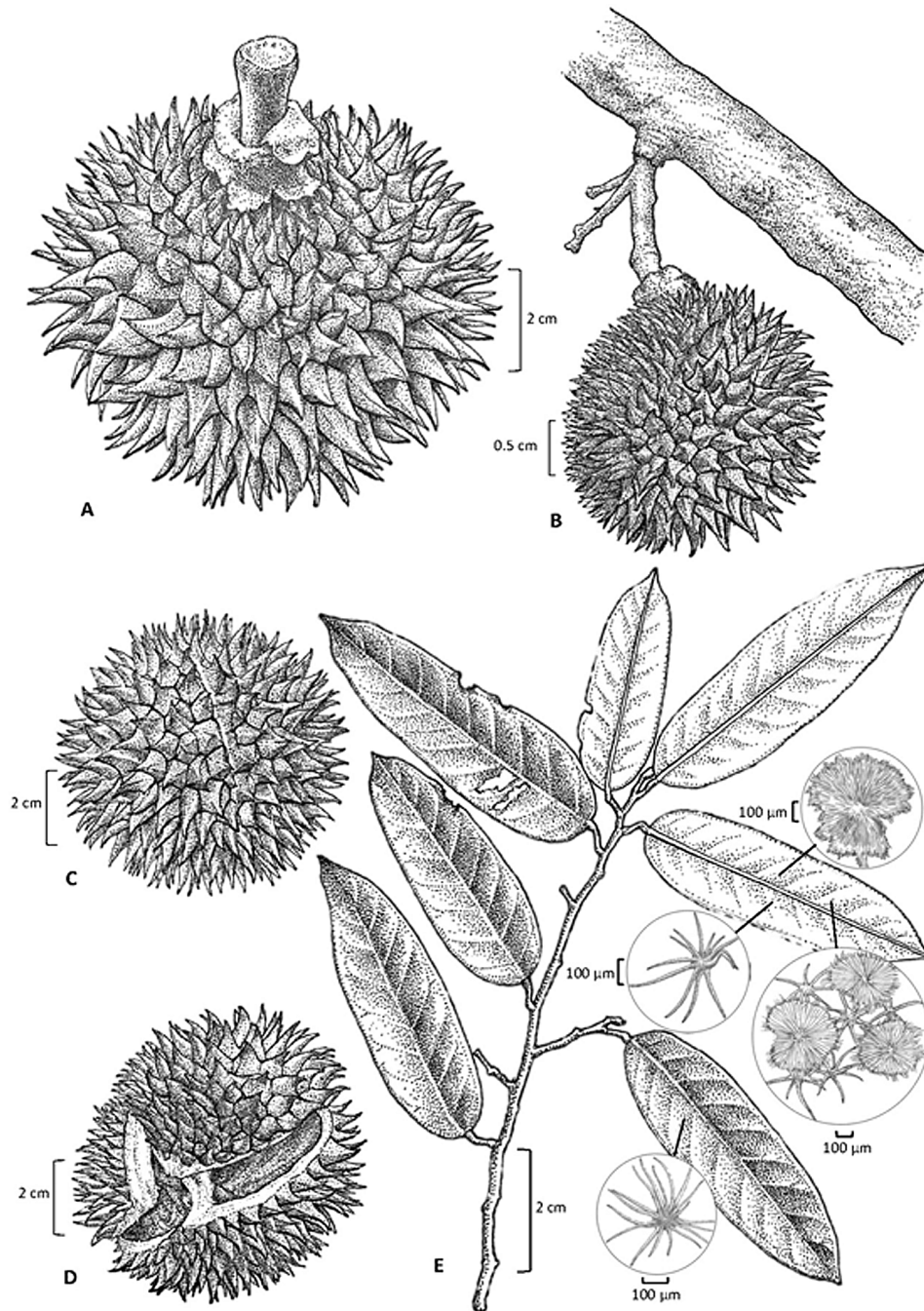


FIGURE 6. *Durio gerikensis* A) fruit. B) fruit attached to the branch. C) abaxial view of the fruit. D) dehiscent fruit. E) leaf morphology with dentate-lepidote trichome, 18–20-armed stellate trichomes, dentate-lepidote scales and 5-armed stellate trichomes with a central cushion. Illustrated by Zulkifli Zainol Alam.

Acknowledgements

The authors are grateful to the curator of the Forest Research Institute Malaysia (KEP), for permission in conducting herbarium specimen analysis. Appreciation is also extended for the financial assistance provided through MARDI's development fund (RMK11-407: P21003004070001) for research project 'Exploration of New Fruits Genera and Related Products for Food Security, Nutrition and Climate Change'. The authors also would like to thank Mr. Mohd. Nor bin Awaluddin and Mr. Masrom Hasran for their technical assistance in wild fruit nursery management. The author is also extremely grateful to Dr. Salma Idris (Malaysian Agricultural Research and Development Institute), and sectional editor for their technical advice, critical reading and editing of the manuscript.

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