



Amomum jackliamii, A new zingiberaceae species from western Sarawak, Borneo

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Abstract

Amomum jackliamii, a new Zingiberaceae species is described herein. The new species is close to *Amomum stenosiphon* but this species has white prickly hairs towards the leaf tip at both edges of the leaf margin at the apex, adaxially surface reddish to dark green when matured. The leaves produce lemony smell and strong smell on the root when crushed white-cream flowers, the lip has a yellow centre bordered by two red lines, about 8.5 cm long, that gradually open. With the discovery of the new species, the number of *Amomum* species in Sarawak now has increased to four species.

Keywords: Species, sarawak, borneo, zingiberaceae

Introduction

Mount Sejinjang (or the Bidayuh elders called it Dorod Sejanjang) is located just behind the well-known Mount Singai. Also connected to Mount Serapi but unfortunately just outside the Totally Protected Area—the Kubah National Park. After many years, Mount Sejinjang is still uncovered as to date there is no single record has been published from this area yet. The area vastly covered by the untouched virgin mixed dipterocarp forest, under the care of the Singai's communities, has a great potential for natural ecotourism products, and, as well as for ecological studies.

The understorey vegetation is very rich, particularly with the monocots groups, such as aroids, arrowroots, sedges, palms and gingers. Also from the group of gesneriads, begonias, Rubiaceae and Primulaceae, diverse with species and great density on the forest floor. A preliminary survey on gingers (the first author's PhD project) encountered at least 21 genera consisting of 49 species (excluding seven undetermined taxa). *Alpinia*, *Etingera*, *Zingiber* and *Globba* are the rich most genera recorded with seven, six, five and four species respectively.

The gingers are varied in its habits, with commonly are terrestrial, lithophyte, rheophyte and only few are with epiphytic habit. For instance, *Alpinia epiphytica* Meekiong, Ipor & Tawan, is the only member in the genus *Alpinia* with epiphytic habit. The ginger also diverse in habitat, thriving in shaded forest or alluvial forests, open spaced in secondary forests or along the logging roads, kerangas, riverine and quite a number of species occupied on the limestone areas and as well as adapted to extreme condition on montane forest up to 2000 m and high salinity of mangrove. Thus make the diversity of gingers in Borneo relatively high

After the revision by the de Boer *et al* (2019), the genus *Amomum* now consists of approximately 64 species of which almost half are previously grouped in the genus *Elettariopsis*. The greatest diversity of *Amomum* is now found in Northeast India and the Indo-China, with only few species extending to Sundaland. *Amomum* is a small to large-sized herbs, from a moderately number of leafy shoots

per clump. The inflorescence are creeping or ascending. Flowering heads few to many flower and usually in white color.

The identification process, information related to taxonomy and geographical distribution to confirm species status were obtained from the related literature and specimen information based on Herbarium of Forest Department Sarawak (SAR), virtual online database plantlist (<http://www.theplantlist.org>) and kew Herbarium (<http://www.kew.org/herbat>).

Key to *Amomum* species (species in Sarawak – based on field morphological characteristics)

1. Plant small, less than 45 cm tall*Amomum kerbyi*
Plant larger, more than 45 cm tall 2
2. Leaves produce lemony smell when crushed, leaf adaxial reddish to dark green, hairy along the leaf margin toward the apex*Amomum jackliamii*
Leaves produce pungent/unpleasant bug smell when crushed, leaf adaxial green or pale green, leaf margin entire 3
3. Inflorescence prostrate in the surface soil, corolla c. 3 cm long *Amomum stenosiphon*
Inflorescence from rhizome, corolla shorter, less than 3 cm *Amomum curtisii*

Materials and methods

Plant collection, documentation and specimen identification

Before the study started, written permission is required from the local community of Singai and Jagoi, Bau. The prior inform consents from local communities of both areas are required under Part V of the Sarawak Biodiversity Regulation 2016. The prior informed consent from both communities was obtained on 11 October 2020 with the reference number of UNIMAS/PHD/PIC. The permit for research was obtained on 12 October 2021 with the reference number of SBC-2021-RDP-35-JER.

The local community leaders were approached to help identify informants who are knowledgeable about

Zingiberaceae as a medicinal plant. These informants comprised individuals knowledgeable in the use of Zingiberaceae. They were incorporated into the study as field guides.

Documentation and collection of the ginger flora at Mount Sejinjang, Singai were conducted on October 2021, April and June 2022. For this study, plant collections were carried out with the same informants to allow consistency and to avoid conflicting species identifications and unreliable information. In the study, field parameters were recorded including the details of taxonomy, ecology, soil types and all related information concerning the use of the plant. Most of the gingers species grow in the humid, shady undergrowth, their leafy shoots emerging among the wet litter of the forest trees. Some of the species grow on steep slopes underneath the tree. The specimens of each species were brought to Sarawak Herbarium (SAR) for identification. The herbarium specimens will be deposited at UNIMAS herbarium for reference. The new species were described.

Morphology, taxonomic treatment and microscopic

Fresh samples of 10 useful gingers were collected from Singai and Jagoi, Bau. The propose of study is to obtain the leaf anatomical evidence and micromorphological characteristic that can support the taxonomic conclusions drawn using other characters for the species identification. There are 2 types of taxonomy treatment were conducted to identify the cell of leaf sample for each species.

Microscope digital camera

Sample preparation using rotary microtome

Fresh samples of ten useful gingers were collected from Singai and Jagoi, Bau. The purpose of the study is to obtain the leaf anatomical evidence and micromorphological characteristic that can support the taxonomic conclusions drawn using other characters for species identification. Two types of taxonomy treatment that were conducted to identify the cell of the leaf sample for each species.

The fresh samples were fixed 3:1 AA solution (70% alcohol: 30% acedic acid, sectioned used a sliding microtone (Leica SM2000r) and stained in Safranin and Alcian blue. Subsequent by dehydration in a series of ethanol solutions (50%, 70%, 80%, 90% and 100%, the section was mounted in Canada balsam and left for 2 weeks. The samples were then observed under the Olympus DP72 microscope digital camera.

Scanning electron microscopy (sem) imaging

The leaf samples for both abaxial and adaxial part for each species were cut into a small piece. Leaf samples were immersed in FAA fixative (3.7% v/v formaldehyde, 50% ethanol, 5% acetic acid) and subjected to a light vacuum until the samples sank. Samples were then fixed overnight (approximately 18 h) at 4°C. Samples were rinsed 3 times in 25 mm sodium phosphate buffer (pH 7) before dehydrating in an ethanol series (30%, 50%, 70%, 95% and 100% dry, 30 min each step). 100% dry ethanol was changed twice, and the tissue was stored overnight at 4°C before Critical Point Drier (CPD) the next day.

Sample preparation using critical point drier (CPD k850)

The blue valve turned clockwise to pre-cool the chamber to 5°C. The specimens were loaded, and the chamber insert ensure thumb-screw was correctly tightened. The green valve turns clockwise to fill in the chamber with CO₂ liquid. The specimens were soaked and stirred for 3 minutes while maintaining the temperature below 10°C. The processes were repeated 3 times. The specimens were then heated for 35 minutes to reach the 35°C and 1250psi pressure. The samples were de-pressurised for 20 minutes. The dried specimens were then stuck on the aluminium stub attached with carbon tape for the coating process. Samples were applied with platinum-coated before SEM imaging. The aim is to identify differences in trichome, stomata, epidermal cell, subsidiary cell, epicuticular wax and glands.

Species descriptions

Amomum jackliamii ripen & meekiong sp. Nov.

The new species is similar to *Amomum stenosisiphon* with white-cream flowers, the lip has a yellow centre bordered by two red lines. The new species however can be differentiated by the white prickly hairs towards the leaf tip at both edges of the leaf margin at the apex, adaxially surface reddish to dark green when matured. The leaves produce lemony smell and strong smell on the root when crushed.

Type

Borneo, SARAWAK, Kuching Division, Singai, Gunung Sijanjang, mixed dipterocarp forest, alluvial soils, 01°34'16.56"N, 110°12'11.45"E, 989 m above sea level, 9 April 2022, *Meekiong, K. & Ripen, J.E., MK4026* (SAR holo; SBC, Herbarium Universiti Malaysia Sarawak-iso).

Description

Perennial herbaceous species with creeping rhizome, crump with 5 cm distance between each plant, up to about 60 cm tall, provided of 5-7 leaves, on a 10, 15-20 cm long petiole, 13-18 cm long and 4-7 cm broad, with entire margin and about 1-2 cm long caudate apex, upper surface green colour and under surface of the young leaves brownish colour. The leaves produce lemony smell and strong smell on the root when crushed. Leafy shoot 5-6 leaves. Lamina oblanceolate to narrowly elliptic, 15-30 cm long and 5-10 cm wide, apex caudate 2-3cm long, leaf margin glabrous and with white prickly hairs towards the leaf tip at both edges of the leaf at the apex, adaxially surface reddish to dark green when matured with clearly embossed veins, abaxially surface green, both surfaces glabrous. Inflorescences from the base of the pseudostem on short peduncle, grow on the ground at soil level and usually hidden by the thick layer of vegetal debris covering the soil of the forest, with white-cream flowers, the lip has a yellow centre bordered by two red lines, about 8.5 cm long, that gradually open. Tubular calyx, about 2 cm long, corolla with 14-5cm cm long tube, dorsal lobe spatulate and concave (cucullate) and ovate latera lobes, ovate labellum with creped margins, of white colour with yellow centre bordered by two red lines that serves as guide for the pollinating insect. The fruit was not seen. Fast growing species with ornamental and scented plant and growing in humid area.

Habitat

This species thrives very well on ridges and gentle slopes in mixed dipterocarp forests, and alluvial soils at altitudes 90–120 m above sea level.

Distribution

Currently only recorded from the type locality, Gunung Sejinjang, Kuching, Sarawak.

Etymology

The species epithet name is after Mr Jack Liam, a Senior Deputy Director of Forest Department Sarawak (FDS), for his contributions on toward the reseach in Sarawak.

Notes

In the type locality, this new species has sympatric growth with few other gingers species, such as *Alpinia havilandii* K. Schum., *Sulettaria surculosa* (K. Schum.) A.D. Poulsen & Martisen, *Geocharis rubra* Ridl., *Plagiostachys albiflora* Ridl., *Globba brachyanthera* K. Schum., *G. atrosanguinea* Teijsm. & Binn., *Zingiber acuminatum* Val. var. *borneense* R.M. Sm., *Etilingera coccinea* (Bl.) Sakai & Nagam. and *Amomum* sp.

Traditional use

Locally known as Downen poras due to its leaves that produce a slightly spicy smell. The leaves are crushed and smell a freshener and to treat headaches.



Plate 1: *Amomum jackliamii* A. whole plant. B. Erect inflorescence C. White prickly hairs towards the leaf tip D. Inflorescence with flowers prostrate in the surface soil E. Close up of inflorescence F. Close up of labellum, stamen. G. Close up of labellum and stamen.



Plate 2: *Amomum jackliamii* flower and its dissected parts in comparison. H. Close up of labellum and stamen. I Front view of flower J. Labellum, dorsal corolla lobes and stamen. K. Close up of flower with calyx (side view) L. Flower without calyx

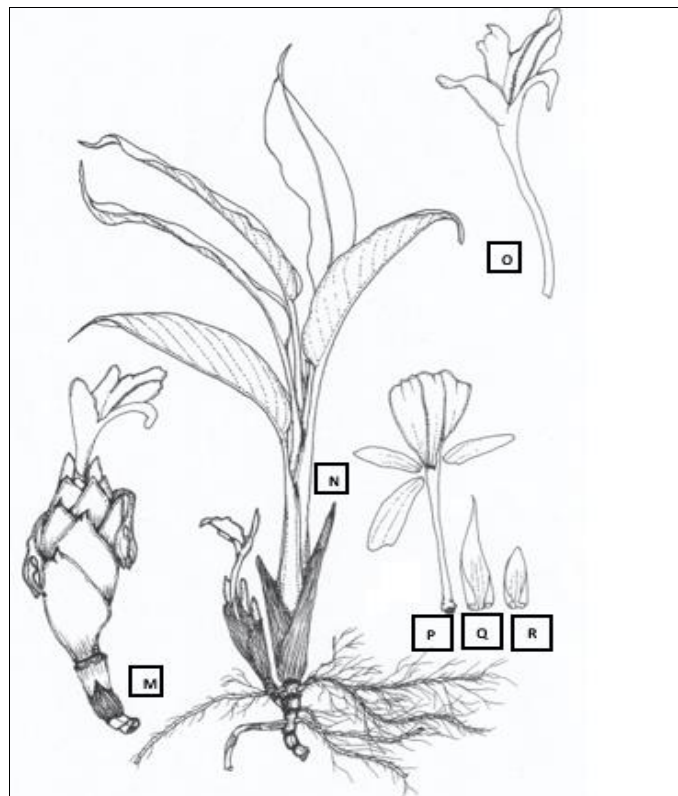


Plate 3: *Amomum jackliamii* Jovita & Meekiong. M. Pseudostem base with lateral inflorescence. N. Leafy shoot. O. Flower, lateral view. P. Flower with calyx removed. Q. Calyx. R. Calyx apex. From MK4026 drawn by Meekiong Kalu.

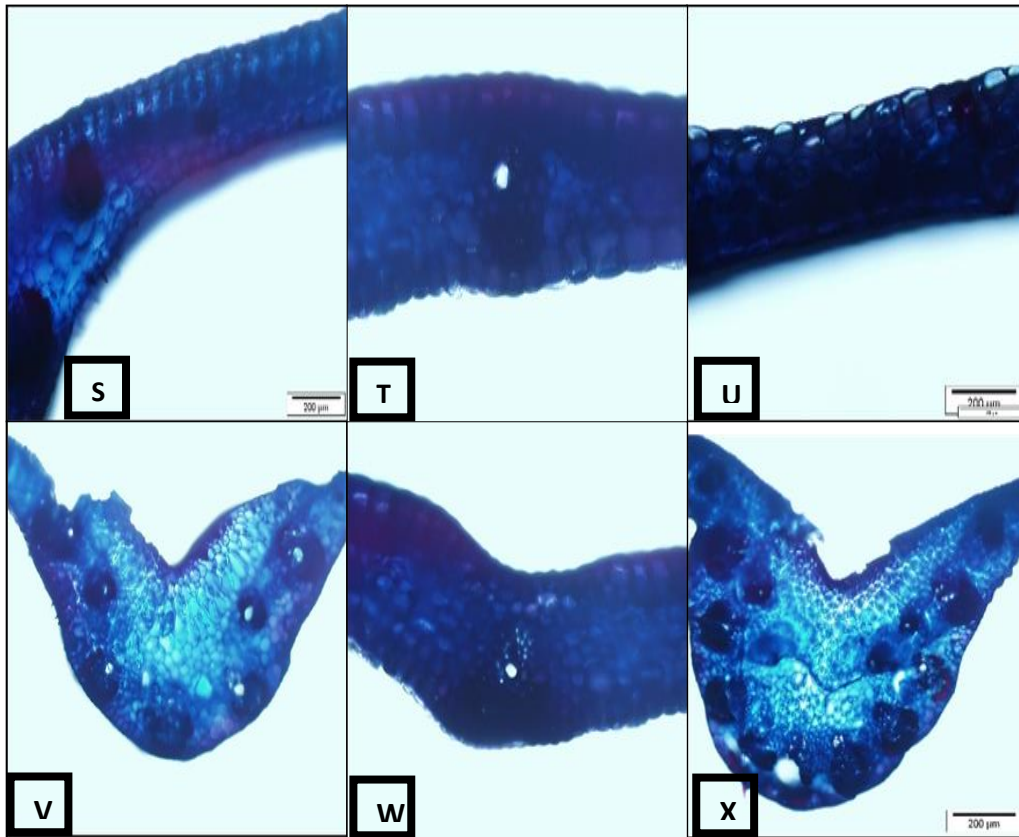


Plate 4: Transverse sections of leaf lamina of *Amomum jackliamii*. S: Apex part of lamina Scale bars=200 μm T. Middle part of lamina Scale bars=200 μm U: Base part of lamina Scale bars = 200 μm

Transverse sections of leaf midribs of *Amomum jackliamii* V: Apex part of midrib Scale bars = 200 μm. W: Middle part of midrib Scale bars = 200 μm. X. Base part of midrib Scale bars = 200 μm.

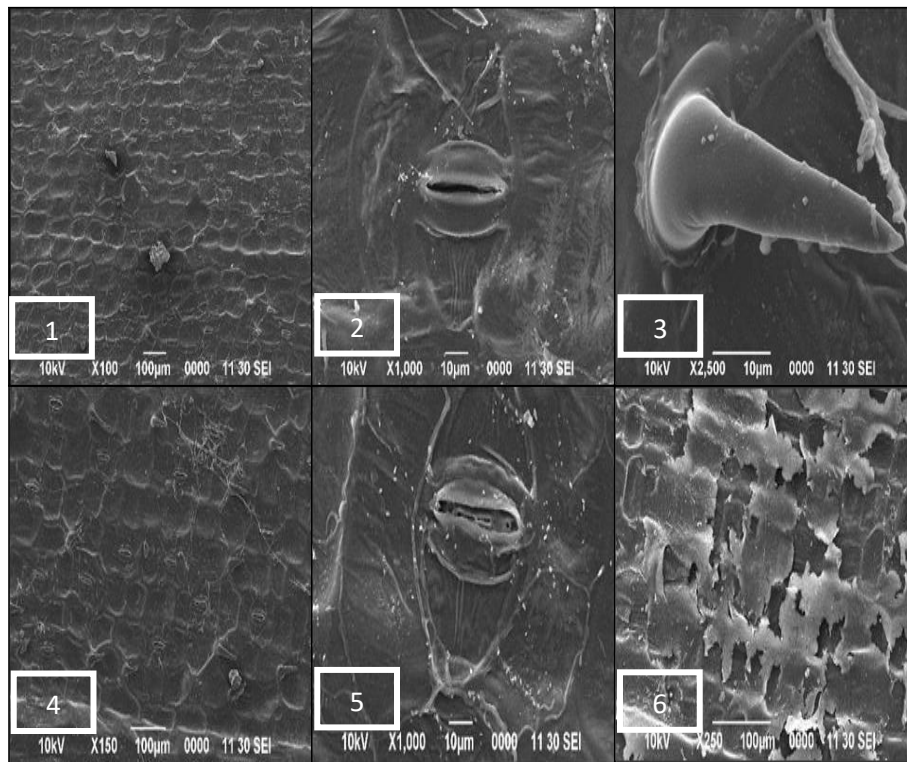


Plate 4: Scanning electron micrographs of *Amomum jackliamii* 1. Distribution of stomata and trichome of leaf abaxial. 2. Distribution of wax around stomata of leaf abaxial 3. Short and stunted trichome of abaxial lamina. 4. Distribution of stomata and trichome of leaf adaxial 5. Half opened stomata of leaf adaxial 6. Fissured layer of epicuticular wax on leaf abaxial

Discussion

Previously, half of these similar type of plants were grouped in the genus *Elettariopsis*. After the revision by the de Boer *et al* (2019), these plants were revise under genus *Amomum*. Now genus *Amomum* consists of approximately 64 species. The greatest diversity of *Amomum* is now found in Northeast India and the Indo-China, with only few species extending to Sundaland. *Amomum* is a small to large-sized herbs, from a moderately number of leafy shoots per clump. The inflorescence are creeping or ascending. Flowering heads few to many flower and usually in white color.

Corollary

The discovery of the new *Sulettaria* was fortuitous but indicates that there are still novelties to be encountered, at least for Zingiberaceae, within the Kuching Division, Sarawak, notwithstanding pass-encompassing studies. With the finding of this new species, the number of *Sulettaria* in Sarawak has now increased to 14 species.

Acknowledgement

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