



Biological Resource and Traditional Uses of the Genus *Hellenia* in Thailand with A New Variety from Thailand

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ABSTRACT

Hellenia is a genus within the family Costaceae, comprising a total of eight species recognized worldwide. In Thailand, two species, each with one variant, have been identified within this genus. This study describes and illustrates a newly discovered variety, *Hellenia speciosa* (J.Koenig) S.R.Dutta var. *sepalus*, found along Nittayo Road in Sawang Daen Din Subdistrict, Sawang Daen Din District, Sakon Nakhon Province, Northeastern Thailand. Although it resembles *Hellenia speciosa* (J.Koenig) S.R.Dutta, this variety differs notably in its calyx structure, which is tubular with three reddish teeth, two equal teeth and apex acute, and one tooth with an apex curves downward. The study provides a comprehensive description of the new variety, including an investigation of its ecological factors, natural occurrence dates, geographical range, uses, and photographic documentation. Two ecosystem types were identified: deciduous dipterocarp forest (supporting one species and one variety), and mixed deciduous forest (supporting one species). The conservation status of one species is proposed as Least Concern (LC), while the new variety is considered both endemic and rare. Traditional uses of this genus include medicinal, ornamental, food, and ritual applications. This research contributes valuable biological resource data on *Hellenia* in Thailand.

Keywords: *Hellenia speciosa* var. *sepalus*, New variety, *Hellenia*, Costaceae, Thailand.

Introduction

Thailand's high biodiversity is attributed to its location in the tropical region north of the equator and its climate, which provides an appropriate environment for a wide range of species and habitats. This enables ecosystems to adapt and thrive in response to changing climatic conditions. Due to its climate variations and geographical diversity, Thailand possesses some of the most diverse biological resources in the world. Thailand is home to around 15,000 plant species, representing a significant portion of the world's total flora. The country has extensive forests, and plants in Thailand serve various essential functions for human life, including providing food, vegetables, fruits, building materials, medicine, and clothing. *Hellenia*, formerly known as *Costus*, is a genus within the family Costaceae, order Zingiberales.^{1,2} The genus comprises eight species that are approved and recognized worldwide.¹ The plant genus is indigenous to Southeast Asia, southern China, the Indian Subcontinent, New Guinea, and Queensland.^{1, 2} The plant is collected from its natural habitat for local pharmacological and food utilization, and in many tropical regions, it is often cultivated for ornamental purposes.² Thailand has recently confirmed the presence of five species in the Costaceae family, with three species belonging to the genus *Hellenia*. *Hellenia speciosa* (J.Koenig) S.R.Dutta or crêpe ginger, is found as wild plant and widely cultivated as an ornamental.

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This species is naturally found in Tropical and Subtropical Asia, extending to Northeast Queensland. It is plants with rhizomes and predominantly grows in the humid tropical habitat.^{1,2} *Hellenia speciosa* (J.Koenig) S.R. Dutta belongs to this genus.^{1, 3} Furthermore, *Hellenia speciosa* (J.Koenig) S.R.Dutta is extensively reported in Thailand.³ During a floristic survey in northeastern Thailand in 2021, several specimens were collected, including *Hellenia* taxa. One interesting taxon of the genus *Hellenia* was observed along the route from Sawang Daen Din District to Phang Khon District, of Sakon Nakhon Province, Thailand. The morphology of this taxon is studied and found to be similar to *Hellenia speciosa* (J.Koenig) S.R.Dutta but differing in the bract. Therefore, it is described and illustrated as a new variety below and compared with typical variety. The objective of this project is to investigate diversity, conservation status, traditional uses, and a new variety of the genus *Hellenia* in Thailand. The authors also provide a comprehensive explanation of the morphology, drawings, color photos, distribution, ecology, phenology, information regarding its conservation status, and a comparative table of morphological characteristics in relation to similar species.

Materials and Methods

Plant material and diversity study

The vouchers for the samples of the *Hellenia* genus have been collected during field expeditions in Thailand from January to December 2021. The samples have been kept in the Mahasarakham University Herbarium, located in Maha Sarakham Province, Thailand. Field observations were carried out to document the diversity of the *Hellenia* genus, including vernacular names, distribution data, ecological data, and phenology. The dominant features, such as the color, have been recognized in the field. The plants investigated showed the ability to accurately ascertain the appropriate scientific nomenclature by consulting botanical publications from several nations in close

proximity to Thailand. The species investigated in the present research were compared with herbarium specimens deposited at herbaria abroad, specifically BK, BKF, KKKU, QBG, and PSU, as well as relevant taxonomic literature and online photographs.

A new variety material

In 2021, while conducting research on the route from Sawang Daen Din District to Phang Khon District in Sakon Nakhon Province, located in northeastern Thailand, the authors collected an interesting taxon of *Hellenia* specimens. Voucher specimens had been formally deposited at the Mahasarakham University Herbarium (MSU), and the plant specimens were carefully maintained in a 70% ethyl alcohol solution. This research involved a thorough review of the available published literature on *Hellenia*.^{1, 3} The research analyzed the type specimen and protologues of all documented species within this genus. The research concentrated on the geographical distribution of these species in Thailand and adjacent countries, specifically Myanmar, China, Laos, and Vietnam.^{3, 4, 5, 6, 7} The process of investigation also involved taking into account any digital information that might be relevant for the topic. All morphological characteristics were evaluated and documented employing fresh materials, herbarium specimens, and spirit specimens under a stereomicroscope. A preliminary conservation assessment was conducted following the guidelines established by the IUCN Standards and Petitions Committee in 2023.⁹ The gathering of information including vernacular names, ecology, and distribution was done via fieldwork. A comparative analysis was conducted on the morphological characteristics of *Hellenia speciosa* (J.Koenig) S.R.Dutta var. *sepalus* in relation to all of the extant published material regarding *Hellenia speciosa* (J.Koenig) S.R.Dutta.^{1, 2, 3}

Traditional uses study

The traditional utilization of *Hellenia* genus in Thailand, encompassing its applications as food, spices, ornamental plants, and ritual plants, were documented through interviews with twenty people, particularly those with expertise in traditional medicine.

Conservation status study

- A study was conducted on the endemic species of the *Hellenia* genus from Thailand, using data from POWO.¹

- A study was conducted on the global criteria for evaluating the conservation status of the *Hellenia* genus from Thailand using an international standard database.⁹

Results and Discussion

Diversity of *Hellenia* genus from Thailand

A total of two species and one variety of the *Hellenia* genus, namely *H. globosa* (Blume) S.R. Dutta, *H. lacera* (Gagnep.) Govaerts, *H. speciosa* (J. Koenig) Govaerts, and *H. speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk were found in Thailand, which consistent with previous study.^{2, 4}

The distinguishing characteristics of all these all specimens are reported as follows. All taxa have the inflorescence emerges at the tip of the shoot. Moreover, the dominant character of *H. lacera* (Gagnep.) Govaerts has the stem straight and when mature does not curve into a spiral. While the dominant features of *H. speciosa* (J. Koenig) Govaerts, and *H. speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk has been found the stem straight and when old it curves into a spiral. The ecology of all species was recorded from deciduous dipterocarp forest (*H. speciosa* (J. Koenig) Govaerts, and *H. speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk) and mixed deciduous forest (*H. lacera* (Gagnep.) Govaerts), which consistent with previous studies.^{2, 4} The phenology of all taxa was recorded between May to October, which consistent with previous study.^{2, 4}

Conservation status of all taxa are proposed as below. *H. lacera* (Gagnep.) Govaerts and *H. speciosa* (J. Koenig) Govaerts were reported as non-endemic species based on POWO.¹ Evaluation criteria for the conservation status of this genus, according to the IUCN database in 2023,⁹ have listed only *H. speciosa* (J. Koenig) Govaerts as Least Concern (LC).

A new variety

Taxonomic treatment

Hellenia speciosa (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk var. nov.

Type:—THAILAND. Saensouk 1500, GPS position (17.4721° N, 103.4730° E), Nittayo Road, Sawang Daen Din Subdistrict, Sawang Daen Din District, Sakon Nakhon Province, Thailand, 10 July 2018 (holotype BK!, isotype QBG!). (Table 1 and Figs. 1-2). Perennial herb, erect, stem 80–120 cm high, often spirally curved, lower half of stem covered by bladeless sheaths, upper half leafy. Leaves numerous; leaf sheaths 3-4 cm long, green flushed with purple, silky hairy with longer hairs at the margins; petiole up to 7 cm long with hairy, green with reddish; lamina oblanceolate-oblong, up to 20-25 × 5-7 cm, upper surface green and glabrous to appressed hairy, lower surface greenish, densely sericeous, apex acute, base rounded, margins white, silky hairy with longer hairs. Inflorescence up to 12 cm long, up to 6 cm broad, usually curved peduncle; bracts 10-15 cm long, each subtending 1 flower, ovate apex acute, green-green often flushed with reddish, with a narrow red fleshy protuberance up to 5 mm long, sparsely hairy; bracteoles c. 10 mm, apex acute with ciliate margin. Flower white to whitish with pinkish; calyx green turning yellow-red to red, longer than bract, up to 2.5 cm including the ovary, with 3 reddish teeth, two equal teeth and apex acute, one tooth apex curved downward outside; corolla tube shorter than calyx, lobes 4-5 cm, white or pinkish; labellum 5.5-8 in diameter, white with a median yellowish band with long yellow hairs; stamen c. 2.5 cm long, filament when flattened 10-12 mm broad, yellow at apex, pubescent; ovary flattened, 9-10 mm broad. Capsule red, ridge, glabrous. Seeds black.

Table 1: Difference in *Hellenia speciosa* (J.Koenig) S.R.Dutta and *H. speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk.

Characters	<i>H. speciosa</i> (based on Larsen 2008) ³	<i>H. speciosa</i> var. <i>sepalus</i>
Calyx	calyx tubular with 3 reddish teeth, equal and apex acute	calyx tubular with 3 reddish teeth, two equal teeth and apex acute, one tooth apex curved downward outside

Flowering & Fruiting: Blooming and fruit production occurs between June and December.

Etymology: The specific epithet of the new variety is derived from calyx, its dominant characteristic. (Figs. 1-2).

Distribution: Endemic to Thailand, this new variety is rare and found only at the type locality in Sakon Nakhon Province, Northeastern Thailand (Figs. 1-2).

Ecology: It occurs throughout wide-open areas and in dry deciduous forest regions.

Vernacular Names: Ueang-Mai-Na

Uses: The leaves and inflorescences, including flowers of this new variety are used as ornamental plant.

Preliminary conservation status: *Hellenia speciosa* (J.Koenig) S.R.Dutta var. *sepalus* is endemic to the northeastern part of Thailand and is currently known only from one population in the type locality. The Extent of Occurrence (EOO) is estimated to be less than 10 km² and the Area of Occupancy (AOO) is estimated to be smaller than 6 km². The total number of individuals is less than 500. Therefore, the conservation status of *Hellenia speciosa* (J.Koenig) S.R.Dutta var. *sepalus* is provisionally assessed as Critically Endangered based on currently available data [CR: B1ab(ii), B2ab(ii)], according to IUCN Standards and Petitions Committee in 2023.⁸



Figure 1: *Hellenia speciosa* (J.Koenig) S.R.Dutta and *H. speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk: A & B) Inflorescence, flower and calyx (arrow), tubular with 3 equal teeth and apex acute of *H. speciosa* (J.Koenig) S.R.Dutta; C & D) Inflorescence, flower and calyx (arrows), tubular with 3 teeth, two equal teeth and apex acute, one tooth apex curved downward outside of *H. speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk, Photographs by Surapon Saensouk.

The traditional uses of the genus *Hellenia* in Thailand

All of these taxa are utilized for food, ornamental exhibit, rituals, and medicinal purposes.

Hellenia speciosa (J.Koenig) S.R.Dutta: The following documents detail the plant's traditional uses:

Food proposes: The edible vegetation that grows during the rainy season can be eaten as food. However, it must be boiled beforehand to eliminate any odor. Once boiled or blanched, it is used as a condiment for vegetables, typically accompanied by chili paste, or utilized in culinary purposes. Fresh young leaves are eaten with various chili pastes such as bamboo shoot chili paste, mushroom chili paste, etc. All of the parts of the plant are edible and can be used as food for animals such as cattle and buffalo.

Medicinal proposes: The stems are roasted over an open flame, and their juice is extracted and administered as drops into the ears to treat otitis media. The roots are used as a therapeutic treatment for dermatological conditions. The leaves have antipyretic qualities.

Ornamental proposes: This plant is a popular cut flower used to decorate vases with inflorescences, as both the plant and the decorative sheaths are particularly beautiful. It is popularly grown as an ornamental plant due to its ease of cultivation.

Ritual proposes: The leaves are used in the buffalo spirit ceremony, which is conducted to ask for forgiveness from a buffalo after it is scolded or beaten by a farmer during tillage. The whole plant is used in rituals before rice farming. It is placed on a stick in the rice field before planting rice to inform the owner that rice will be planted in that rice field. It is believed that this will help the rice grow and flourish.

Hellenia lacera (Gagnep.) Govaerts: The resulting records provide a comprehensive account of the plant's traditional applications:

Medicinal proposes: The roots and rhizomes are used to treat stomach aches, kill parasites, and neutralizing insect poisons. They also treat coughs, act as a laxative, and have purgative properties.

Ornamental proposes: The inflorescences are used to decorate vases, and the whole plant is grown as an ornamental plant in gardens.

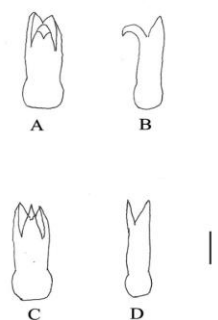


Figure 2: Difference apex of calyx in *Hellenia speciosa* (J.Koenig) S.R.Dutta and *H. speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk: A & B) *Hellenia speciosa* (J.Koenig) S.R.Dutta var. *sepalus*; calyx tubular with 3 reddish teeth, two equal teeth and apex acute, one tooth apex curved downward outside. C & D) *Hellenia speciosa* (J.Koenig) S.R.Dutta; calyx tubular with 3 reddish teeth, equal teeth and apex acute (scale bars = 1 cm), Drawn by Surapon Saensouk.

Conclusion

Thailand has identified three species, each with one variant, belonging to this particular genus, including a newly discovered variety of the *Hellenia* plant. The morphological characteristics of *Hellenia speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk are similar to those of typical variety of *Hellenia speciosa* (J.Koenig) S.R.Dutta, but it differs in its calyx, which is tubular with three reddish teeth, two equal teeth and apex acute, and one tooth with an apex curved downward on the outside (Table 1 and Figs. 1-2). Therefore, the calyx is the dominant characteristics of this new variety. The inflorescence for all taxa develops in the apical part of the shoot. An important distinctive feature of *H. lacera* (Gagnep.) Govaerts is that its stem is straight and does not form a spiral when fully grown. In contrast, the most important features of *H. speciosa* (J. Koenig) Govaerts and *H. speciosa* (J.Koenig) S.R.Dutta var. *sepalus* Saensouk & P.Saensouk is a straight stem that gradually spirals as it ages. Ecological data for all species were obtained from deciduous dipterocarp and mixed deciduous forests. Phenological data for all taxa were collected from May to October. The conservation status of all taxa is reported as follows. *H. lacera* (Gagnep.) Govaerts and *H. speciosa* (J. Koenig) Govaerts are not considered endemic species, according to the Plant List of POWO.¹ The conservation status of these taxa will be evaluated using the criteria provided by IUCN database in 2023. The only species designated as Least Concern (LC) is *H. speciosa* (J. Koenig) Govaerts. The traditional uses of this genus include applications in medicine, ornamentals, food, and rituals.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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