

A new record Species for Flora of Vietnam - *Curcuma singularis* Gagnep. (Zingiberaceae)

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Received 16 December 2016

Revised 18 January 2017; Accepted 23 March 2017

Abstract: *Curcuma singularis* Gagnep., a new record species from the Central Highlands (Gia Lai prov., KBang dist.) is described and illustrated with pictures, and compared to some species in the same group "Ecomata", together with a species with similar morphological characteristics from another group: *Curcuma cochinchinensis*. The species *C. singularis* is known by locals as Cay khoe or Sam da, and its rhizomes are used by inhabitants to help them improve health.

Keywords: *Curcuma arida*, *C. newmanii*, *C. sahuynhensis*, *C. stenochila*, *C. xanthella*, *C. cochinchinensis*, Gia Lai, KBang.

1. Introduction

Curcuma L. is a rather large big genus in the Ginger family (Zingiberaceae), containing nearly 100 species with distribution in Southeast Asia, Southern China, India, New Guinea, Northern Australia and some species in tropical Africa, Central America. There were 17 species of *Curcuma* in the Indochina (Gagnep. 1908) [1], Pham Hoang Ho (1993, 2000) [2, 3] recorded 14 species of *Curcuma* in Vietnam. During a survey of the genus in the Central Highland of Vietnam, we discovered *Curcuma singularis*, whose local name is Cay khoe or Sâm đá in the KBang dist. (Gia Lai

prov.). This is a new record species for flora of Vietnam and updates the total number of *Curcuma* species in Vietnam to 28. In this article, we provide identifying characteristics, pictures, comparisons with related species, and the usage and potentials of *Curcuma singularis*.

2. Materials and methods

Studied specimens includes dry specimens kept in the herbarium at Vietnam National Museum of Nature (VNMN), Institute of Ecology and Biological Resource (HN), Institute of Tropical Biology (VNM), etc., together with new specimens obtained during the survey in KBang Dist. (Gia Lai Prov.).

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Comparative morphological methods were used to identify plants. These are still the standard methods used in botanical classification.

3. Results and discussion

Describe a new record species for flora of Vietnam:

Curcuma singularis Gagnep. 1907. Bull. Soc. Bot. Fr.54: 407; Gagnep. 1908. Fl. Gen. Indoch. 6: 61-62.

Vietnam name: Cây khô, Sâm đá

Characteristics: Small herb, 30-50 tall. *Rhizome* horizontal, cylinder, aromatic; fibrous roots; usually root tips swollen form ovate or fusiform, externally brown, internally whitish, buried deeply in the ground. *Leaves* 3-6, *lamina* 10-22 × 5-7(-9) cm, ovate or oval, apex acuminate, base rounded or cuneiform, adaxially green, glabrous, abaxially lighter green, pubescent; petiole 5-9 cm long, canaliculate; *ligule* light brown when young, after turn into light-yellow color, thin, 1-1,5 mm long, tip concave divide into two lobes, ciliated at the top; *leaf sheaths* light brown-purple when young. *Inflorescence* lateral. *Bracts* 5-8, green, triangular ovate, 3-4 cm long, 2,5-3 cm wide, apex obtus. *Cincinni* with 4 flowers. *Bracteoles* very small. *Flowers* 7-8,5 cm long, exerted from bracts; tubular calyx, 2-2,5 cm long, thin, white, pubescent externally, short unilateral incision, splitted into 3-lobes form equal triangles towards apex. Part lower of corolla form tubular, white, 4-4,5 cm long, slightly flared towards the apex, upper divided into three lobes, 2,2-2,6 × 1,5-2 cm, narrow ovate, concave, white, dorsal corolla with mucronate; *labellum* large obovate, 2,2-2,5 × 1,8-2,1 cm, apex emarginate, incised 1-1,5 mm long, white, with band yellow colour along midrib; *lateral staminodes* 2, unequally narrow obovate, 2,5-2,8 × 1,2-1,5 long, white, with band yellow along midrib, to 1/2 length staminodes; *filament* 4-5 mm long, 3-4 mm wide at base, 1,5-2 mm wide toward upper, white; *anther* 2 lobes, 9-11 mm long, base of

each lobe prolonging into flat spur, equal, 3-4 mm long, spur creating blunt angle with anther. *Style* filiform, 4,5-5,5 cm long, white; *stigma* funnel-shaped; *stylodes* two, awl form, slender, 3-4 mm long; *ovary* 4-5 × 3-4 mm, oval, densely puberulent, white. *Fruit* globular trilocular capsule, ivory white, 10-11 mm in diameter; *seeds* ovate, slightly angled, 3-4 mm long, 2-2,5 mm wide, white; aril hyaline white, splitting into lobes (Fig. 1).

Loc. class.: Laos (Pissay). **Holotype:** Thorel 3194 (P)

Habitat: Grows in secondary forests, forest edges, on fields in the mountains, at an altitude of 400-1000m.

Phenology: The inflorescences appear just before the leaves, the flowers open from March to May; fruits from June to July, not too much plants with fruit.

Distribution: Vietnam (Gia Lai: Sa Thay, KBang). Thailand, Laos, Cambodia.

Specimens: Gia Lai (Sa Thay), Nguyễn Quốc Bình, Hoàng Anh Tuấn, SH16 (VNMN); Gia Lai (KBang), Nguyễn Quốc Bình, Hoàng Anh Tuấn, SH30 (VNMN) (Fig. 1).

Use value: Locals used rhizomes of *Curcuma singularis* to improve their health by drinking beverage made from boiling it in water, or infuse its swollen part of the root tip in alcohol. People also use its extracted liquid made by from soaking the plants in alcohol to massage the bruises for relief and improved healing. The chemical composition of the essential oil extracted from the rhizome of *Curcuma singularis* by steam distillation was analyzed by GC-MS. A total number of 68 constituents were detected, among which 47 chemical compounds (accounting for 62.96% of the oil) have been identified. The main compounds are: camphor (23.63%), isoborneol (2.24%), endo-borneol (3.06%), terpinen-4-ol (3.51%), copaene (2.56%), acoradiene (2.89%) and turmerol (2.65%). Analysis results of chemical also showed that the chemical composition of *Curcuma singularis* contain eight isolated compounds, with two new

diarylheptanoid compounds (Curcusin A and Curcusin B) showing potent inhibiting effects against sEH. In medicine, sEH inhibitors are one significant subjects in cardiovascular disease research.

Curcuma singularis belongs to the group “Ecomata” (Sirirugsa, P. et al., 2007) [5], but differentiate from the other species by the color of its bracts, labellum and staminodes (see Table 1).



Fig. 1. A. Herb with inflorescences-fruit lateral; B. Inflorescences and rhizome; C. Root tip swells into tuber-shape; D. Bract; E. Inflorescences; F-G. Labellum, lateral staminodes in front and inclined views; H. Bract and cincinni; I. Calyx; J. Corolla lobes; K. Anther and spur; L. Two stylodes and ovary; M. Fruit; N. Seed and aril; O. A cincinni; P. Flower dissection (from left): Calyx, three corolla lobes, two lateral staminodes and labellum (between), ovary-two stylodes-style-stigma-anther-spur, corolla tuber. (Photo: Nguyen Quoc Binh).

Table 1. Comparison between *Curcuma singularis* with other species in the same group “Ecomata”

Morphological characteristics	<i>C. singularis</i>	<i>C. arida</i>	<i>C. newmanii</i>	<i>C. sahuynhensis</i>	<i>C. stenochila</i>	<i>C. xanthella</i>
Bract	Green	White	Purple	Pink-white	Pink	light green
Labellum	White, yellow midrib band	Base white, upper yellow with bright yellow midrib band	White, yellow midrib band	Yellow	Yellow	base white, middle and apical part yellow
Staminodes	White, yellow midrib band	Base white, yellow towards apex	White	Yellow	Yellow	Base white, yellow towards apex

It is similar to *C. cochinchinensis* (group “Cochinchinensis”) but there are some characteristic differences (see Table 2):

Table 2. Comparison between *Curcuma singularis* (group “Ecomata”) and *Curcuma cochinchinensis* (group “Cochinchinensis”):

Morphological characteristics	<i>C. singularis</i>	<i>C. cochinchinensis</i>
Corolla tuber	2-2,5 cm long	To 1,5 cm long
Staminodes	White, yellow midrib band	White
Labellum	Large obovate	Nearly like square
Anther	Spurs broad and blunt	Spurs filamentous
Stylodes	Long and slender	Shortly cylindrical

4. Conclusion

Curcuma singularis Gagnep. from Highland is new record species for flora of Vietnam, it is different to closest species about colour, dimension of bract, labellum, staminodes, corolla tube.

The main compounds are: camphor (23.63%), isoborneol (2.24%), endo-borneol (3.06%), terpinen-4-ol (3.51%), copaene (2.56%), acoradiene (2.89%) and turmerol (2.65%). Analysis results of chemical also showed that the chemical composition of *Curcuma singularis* contained eight isolated compounds, with two new diarylheptanoid compounds (Curcusin A and Curcusin B) showing potent inhibiting effects against sEH. In medicine, sEH inhibitors are one significant subject in cardiovascular disease research.

Acknowledgments

This work was supported by a Grant from Vietnam Academy of Science of and Technology, Vietnam (No. VAST 04.10/15-16).

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Một loài bồ sung mới cho hệ thực vật Việt Nam - *Curcuma singularis* Gagnep., họ Gừng (Zingiberaceae)

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Tóm tắt: *Curcuma singularis* Gagnep., một loài bồ sung mới ở Tây Nguyên (huyện KBang, tỉnh Gia Lai) được mô tả và minh họa bằng hình ảnh, loài cây này đã được so sánh với một số loài trong cùng nhóm "Ecomata" và một loài có các đặc điểm hình thái giống nhau nhưng ở nhóm khác: đó là *Curcuma cochinchinensis*. Loài *Curcuma cochinchinensis* được dân địa phương gọi là Cây khỏe hay Sâm đá, thân rễ được người dân địa phương sử dụng để nâng cao sức khỏe.

Từ khóa: *Curcuma arida*, *C. newmanii*, *C. sahuynhensis*, *C. stenochila*, *C. xanthella*, *C. cochinchinensis*, Gia Lai, KBang.