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THREE NEW SPECIES OF FREYCINETIA (PANDANACEAE) FROM KALIMANTAN, INDONESIA

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ABSTRACT
KEIM, A.P. 2009. Three new species of *Freycinetia* (*Pandanaceae*) from Kalimantan, Indonesia. *Reinwardtia* 13(1): 15 –20. — Three new species of *Freycinetia* (*Pandanaceae*) from Kalimantan (Indonesian Borneo) are firstly described in this paper namely *F. kartawinatae* A.P. Keim, *F. runcingensis* A. P. Keim, and *F. subracemosa* A.P. Keim.

Keywords: Borneo, *Freycinetia*, Kalimantan, *Pandanaceae*.

ABSTRAK
KEIM, A.P. 2009. Tiga jenis baru *Freycinetia (Pandanaceae*) dari Kalimantan, Indonesia. *Reinwardtia* 13(1): 15–20. — Tiga jenis baru *Freycinetia* yaitu *F. kartawinatae* A. P. Keim, *F. runcingensis* A. P. Keim, dan *F. subracemosa* A. P. Keim dari Kalimantan dipertelakan untuk pertamakalinya dalam tulisan ini.

Kata kunci: Borneo, *Freycinetia*, Kalimantan, *Pandanaceae*.

INTRODUCTION

The Indonesian Borneo or Kalimantan constitutes the largest part of Borneo, which is approximately 2/3 part of the island. Despite this fact, the pandan flora of Kalimantan, particularly for the genus *Freycinetia*, is still largely unknown. Prior to this study, the most recent systematic study on the genus in Borneo was done by Stone (1970); however, the information provided mainly concerns the Malaysian part (*i.e.* Sabah and Sarawak), whereas the data for Kalimantan was only briefly mentioned or appeared in the list of specimens examined. This paper describes the presence of three new species previously unknown to science, namely *F. kartawinatae* A. P. Keim, *F. runcingensis* A. P. Keim, and *F. subracemosa* A. P. Keim.

Freycinetia kartawinatae A. P. Keim *spec. nov.* — Figs. 1–3.

Robustus scandens; caulis 30 mill. crasus; folia lineari−lanceolata, 43½ –44 cent. longa, 3 cent. lata; bractea auriantica, 22½–3 cent. longa; infructescentia terminalis, terna vel quaterna, pedicellis glabrous; syncarpia cylindricus, 9 cent. longi; stigmata 4 vel 5, plerumque 4. — Typus: Indonesia, West Kalimantan, Ka tingan Hulu, Waringin Timur, on logging road, 2 May 2006, *A. P. Keim 770* (Holotypus–BO!).

Robust climbing pandan, climbing up to 50 m high. *Stem ca*. 9.5 cm circle (*ca*. 3 cm diameter). *Leaves* spirally arranged in 3 ranks (tristichous); each lanceolate–elongate, *ca*. 43.5–44 cm long, *ca*. 3 cm wide, acuminate apex, margin with spines up to 1/3 distally; adaxial surface green, glabrous; abaxial surface pale green, glabrous; auricle tapered, margin integer, brownish yellow to creamy brown; leafsheath yellowish green. *Infructescence* terminal, *ca*. 14 cm long, consists of 3 (ternate) to 4 (quaternate) spirally arranged cephalia; pedicel yellow to pale yellowish orange, glabrous; bracts distinctively bright orange, thick, hard, fleshy, glabrous, acuminate apex, margin with spines, each boat shaped, *ca*. 22.5–23 cm long, caducous. *Cephalium* cylindrical−elongate, *ca*. 9 cm long, *ca*. 3 cm wide, pale green to dull greyish green; stigma 4–5, mostly 4.

Distribution. Known only from the type locality.

Habitat and ecology. Lowland tropical rainforest at about 300 m altitude.

Etymology. After Kuswata Kartawinata, an Indonesian ecologist and keeper of the Herbarium Bogoriense (BO) 1981–1984.

Vernacular names. Kajak rajak, mèrajak (Dayak, Belaban dialect).

Uses. Although not used by local people, Orang Utans and Gibbons are said to consume the bracts.

Notes. In general appearances, *F. kartawinatae* is very similar to *F. insignis*, but different in two morphological characters (Table 1).

Table 1. Morphological differences between *F. kartawinatae* and *F. insignis*.

Characters	*F. kartawinatae*	*F. insignis*
Colour of the bracts	Orange	Purplish white
Number of cephalia per infructescence	3 to 4	3

Regarding the more than three number of cephalia per infructescence thus indicates the section *Polystachya*, Borneo possesses at least one member, *F. kinabaluana*. However *F. kartawinatae* differs from *F. kinabaluana* in several morphological characters (Table 2).

Table 2. Morphological differences between *F. kartawinatae* and *F. kinabaluana*.

Characters	*F. kartawinatae*	*F. kinabaluana*
Position of infructescence	Terminal	Lateral
Shape of cephalium	9X3 cm	5 – 6X3.5–5 cm
Number of cephalia per infructescence	3 to 4	5 to 6

Freycinetia kuchenensis from Borneo known to have a lateral infructescence, reddish orange bracts, and 3 – 4 stigmas; however the two species differ on certain morphological characters (Table 3).

Table 3. Morphological differences between *F. kartawinatae* and *F. kuchenensis*.

Characters	*F. kartawinatae*	*F. kuchenensis*
Leaf dimension	43.5–44Xca. 3 cm	20–22X0.7−1 cm
Number of cephalia per infructescence	3 to 4	2 to 3, according to Martelli (1910)
Shape of cephalium	Cylindrical−elongate (9 × 3 cm)	Globose (3–3.5 X 2 cm)

Although possessing approximately similar length of leaf (40 – 60 cm) and 3 to 4 number of stigmas *F. sarawakensis* differs from *F. kartawinatae* in several characters (Table 4).

Table 4. Morphological differences between *F. kartawinatae* and *F. sarawakensis*.

Characters	*F. kartawinatae*	*F. sarawakensis*
Width of leaf	3 cm	0.5 to 0.7 cm
Position of infructescence	Terminal	Lateral
Number of cephalia per infructescence	3 to 4	1 to 2, according to Martelli (1910)
Pedicel	Glabrous	Scabrid

A taxon from Sarawak has many similarities with *F. kartawinatae* especially regarding the possession of orange bracts, terminal infructescences, and 3 to 4 cephalia per infructescence. This taxon was named *F. andersoniana* by Stone (1967), but invalidly published.

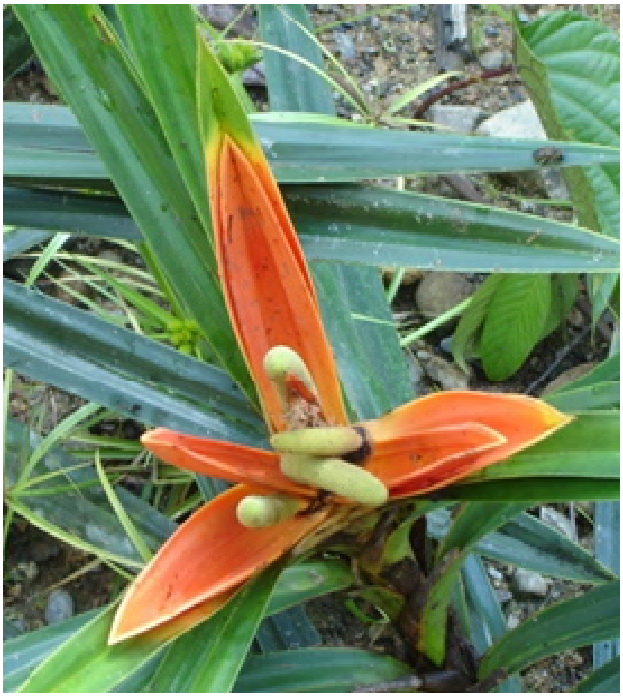

Fig. 1. *Freycinetia kartawinatae* A.P. Keim. A terminal infructescence with 4 spirally arranged cephalia and very distinctive bright orange bracts. Photo: A.P. Keim, Rugayah & H. Rustiami.

Fig. 2. *Freycinetia kartawinatae* A.P. Keim. A terminal infructescence with 3 spirally arranged cylindrical−elongate cephalia with yellow glabrous pedicels. The bracts have already fallen. Photo: A.P. Keim, Rugayah & H. Rustiami.

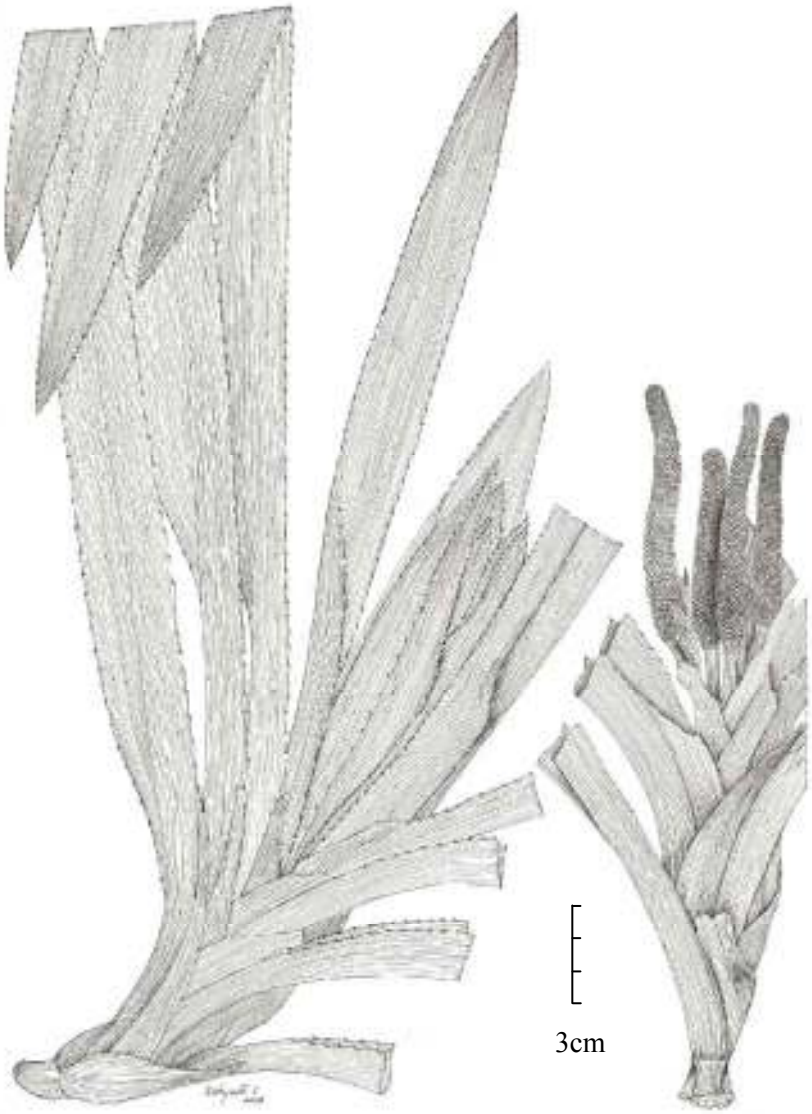

Fig 3. *Freycinetia kartawinatae* A.P. Keim (A. Leaves, B. Terminal infructescence with 4 spirally arranged cephalia). Drawn from the holotype (*A.P. Keim 770*–BO) by Wahyudi Santoso.

Freycinetia runcingensis A.P. Keim *spec. nov.* — Fig. 4.

Gracilis scandens; auricula integra; in male inflorescentia bractea luteus clarus; pedicellus scabrous; stigmata 2 – 3, plerumque 3. — Typus: Indonesia, East Kalimantan, PT KEM area, Gunung Runcing, 0° 20' S 115° 55' E, 23 March 1997, *Kessler et al. PK 2245* (Holotypus–BO!; Isotypus–L).

Slender climbing pandan, climbing up to 5 m high. *Leaf ca*. 20 cm long, *ca.* 0.5 cm wide, acuminate apex, integer margin except in lower most part and apex with minute spines; adaxial and abaxial surface glabrous; auricle tapered, smooth, integer margin. *Male inflorescence* with yellow bracts. *Infructescence* terminal, ternate, *ca.* 3.5 cm long; pedicel obviously scabrous, densely covered with red−brown tomentose, 1.6 – 1.7 cm long. *Cephalium* globose, 7 – 9 mm long, 4 – 6 mm wide, with numerous berries. *Berry* small, 1 – 1.5 mm long; stigmas 2 – 3, mostly 3.

Notes. The differences between *F. runcingensis* and *F. angustifolia* Blume are listed in Table 5. *Freycinetia runcingensis* has exceptionally smaller size of cephalium compared to *F. angustifolia*. The decisive difference between the two species is actually in the surface of the pedicel. *F. runcingensis* has conspicuously scabrous pedicel, while in *F. angustifolia* it is shiny glabrous.

Table 5. Comparison of *Freycinetia angustifolia* and *Frecynetia runcingensis*.

Characters	*Freycinetia angustifolia*	*F. runcingensis*
Size of a cephalium	18 – 24 × 6 – 8 mm, according to protologue (Blume 1835; see also Warburg 1900)	7 – 9 × 4 – 6 mm
Pedicel surface	Glabrous	Scabrous, densely covered with red−brown tomentose
Number of stigmas	3 to 4, mostly 3	2 to 3, mostly 3 (never found more than 3)

Distribution. Only known from type locality.

Habitat and ecology. Lowland tropical rainforest and found along logging road at about 180 m altitude.

Etymology. After Gunung (Mount) Runcing, where the type was collected.

Conservation status. Probably Vulnerable (VU) due to limited area of distribution and the fact that the species has not been recollected.

Freycinetia subracemosa A.P. Keim *sp. nov.* — Fig. 5.

Gracilis scandens; inflorescentia masculis terminalis, spadicis quaterni, sub racemosus dispositus qui 3 spadicis spiralis dispositus dum 1 prominens infimus pedunculus; bracteis luteus ad aurantiacus. — Typus: Indonesia, Central Kalimantan, Km 23, Nyaru Menteng Arboretum, 113° 46.709' E 02° 02.127' S, 30 Oct. 1996, *Kessler et al. PK 1575* (Holotypus–BO!; Isotypus–L).

Slender climbing pandan, climbing up to 6 m high. *Stem ca.* 0.5 cm diameter. *Leaf* lanceolate−elongate, 23 – 25 cm long, *ca.* 0.8 cm wide, glabrous, acuminate apex, margin with minute spines; auricle present, lobed, apex pointed, papery, imbricate, integer margin, 1.5 – 2 cm long. *Male inflorescence* terminal, *ca*. 4.5 cm long, fragrant that resembles *Cananga odorata*; pedicel short, *ca.* 0.5 cm long; bracts yellow−orange, 3 – 5 cm long, 0.4 – 1 cm wide, each support a pedicel, the lower most being the largest; rachis 1.6 – 1.9 cm long; consists of 4 flowering branches, 3 arranged spirally while 1 raises from the lower part of peduncle, thus giving a subracemose appearance.

Field character. Climber, *ca.* 6 m tall, bracts yellow−orange, flowers with very sweet smell like *Cananga odorata*.

Distribution. Only known from type locality.

Habitat & ecology. Swamp forest along the Arboretum trail at about 35 m altitude.

Etymology. Named for the subracemose appearance of the male inflorescence.

Conservation status. Probably Vulnerable (VU) due to limited area of distribution and the fact that the species has not been recollected.

Notes. Although describing a new species of *Freycinetia* based on a staminate collection only is not common; however, this taxon (*Kessler et al. PK 1575*) possesses a unique structure of male inflorescence. The male inflorescence consists of 4 flowering branches, in which 3 are spirally arranged and 1 appears from the lower part of peduncle, thus giving a subracemose appearance. The subracemose arrangement of flowering branches in a male inflorescence is also observed in the Philippine species of *F. jagori* Warb. (Warburg, 1900); however, the two species instantaneously differ in several characters a species that also exists in Sarawak (Stone, 1970)

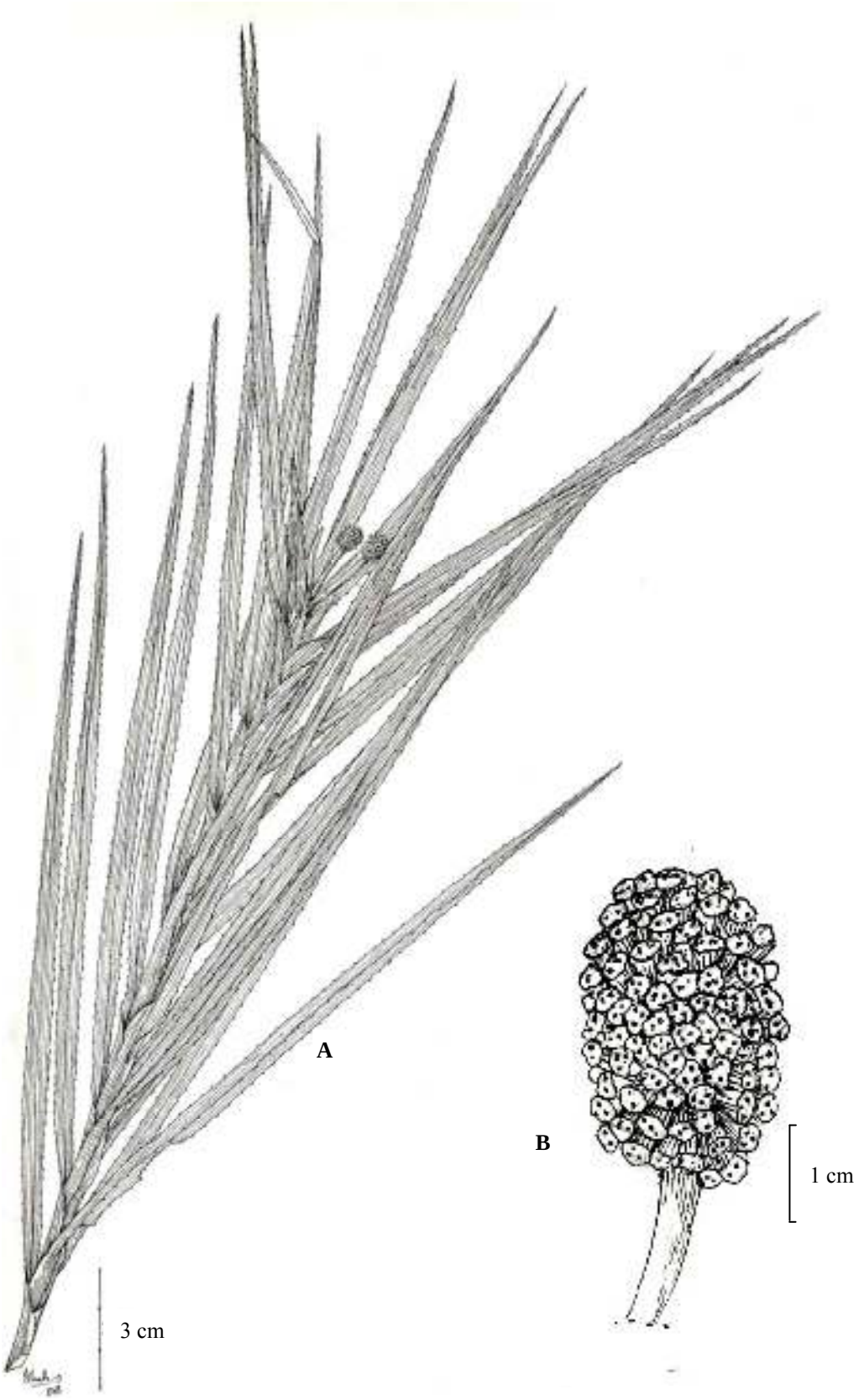

Fig. 4. *Freycinetia runcingensis* A.P. Keim (A. Habit, B. Globose cephalium. Drawn from the holotype (*Kessler et al. PK 2245*–BO) by Iskak Syamsudin.

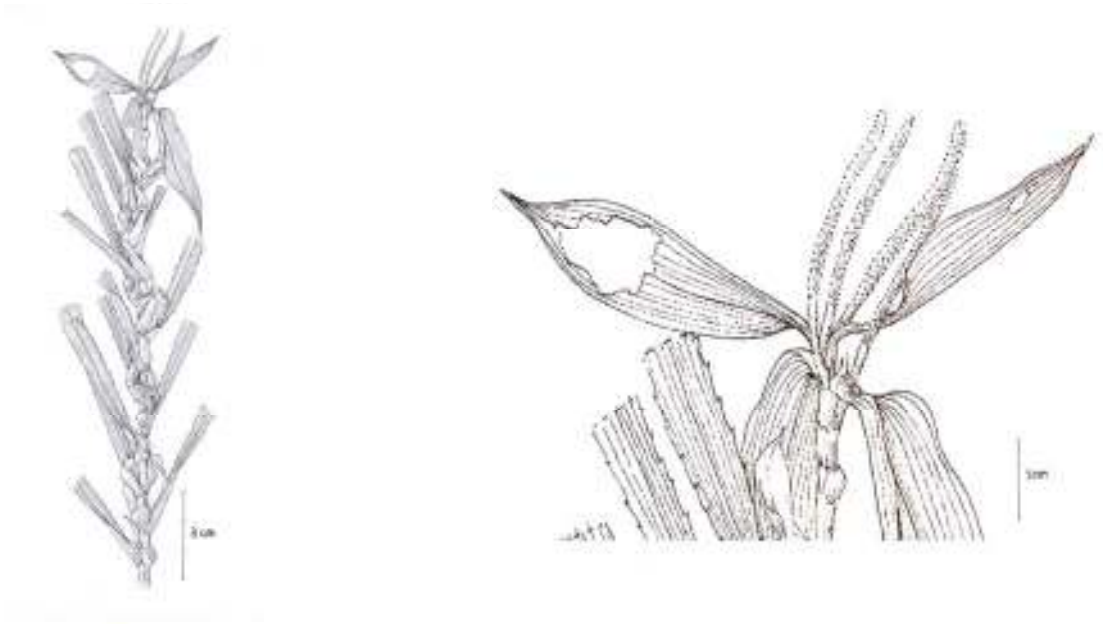

Fig. 5. *Freycinetia subracemosa* A.P. Keim (A. Habit 1x, B. Male inflorescence enlarged 2 1/2x showing the subracemose arrangement of male inflorescences). Drawn from the holotype (*Kessler et al. PK 1575*–BO) by Iskak Syamsudin.

and Kalimantan (Keim *et al*., 2006). There are two other species in the section that share the slender habit with *F. subracemosa*, which are *F. lucida* Martelli and *F. vidalii* Hemsley, but none has the distinctive sub racemose inflorescence

Table 6. Comparison of *F. jagori* and *F. subracemosa*

Characters	*F. jagori*	*F. subracemosa*
Leaf dimension	18X1.5 cm	23–25X0.8 cm
Auricle	Tapered	Lobed
Number of male flowering branches per inflorescence	5; 4 flowering branches subraemosely arranged in 2 pairs, while 1 raises from the lower part of peduncle	4; 3 flowering branches spirally arranged, while 1 raises from the lower part of peduncle, thus giving a subracemose appearance
Length of male flowering branch	2.5 cm	1.6–1.9 cm

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