

Musa lawitiensis Nasution & Supard. (Musaceae) and its intraspecific taxa in Borneo

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ABSTRACT

Musa lawitiensis Nasution & Supard. is re-described based on field studies in Borneo. *Musa lawitiensis* var. *kapitensis* and *Musa lawitiensis* var. *sarawakensis* are described and illustrated as new varieties. *Musa suratii* Argent is proposed to be reclassified as a variety of *Musa lawitiensis* and to be renamed as *Musa lawitiensis* var. *suratii*. Keys and a table for differentiating characteristics of each variety are provided. All these observations and descriptions are based on the author's extensive field studies in Borneo during 2001-2004.

KEY WORDS

Musaceae,
Musa,
wild banana,
Borneo,
new varieties.

RÉSUMÉ

Musa lawitiensis Nasution & Supard. (Musaceae) et ses taxons intraspécifiques à Bornéo.

Musa lawitiensis Nasution & Supard. est redécrit d'après des études de terrain faites à Bornéo. *Musa lawitiensis* var. *kapitensis* et *Musa lawitiensis* var. *sarawakensis* sont décrits et illustrés en tant que nouvelles variétés. Nous proposons de considérer *Musa suratii* Argent comme variété de *Musa lawitiensis* et de la renommer *Musa lawitiensis* var. *suratii*. Des clés et un tableau présentant les caractères différentiels de chaque variété sont inclus. Ces observations et descriptions sont basées sur les importantes études de terrain réalisées par l'auteur à Bornéo en 2001-2004.

MOTS CLÉS

Musaceae,
Musa,
bananier sauvage,
Bornéo,
nouvelles variétés.



Fig. 1. — Common habitat for *Musa lawitiensis* Nasution & Supard.

INTRODUCTION

Borneo is the third largest island in the world. The island is comprised of three countries: Malaysia (Sarawak and Sabah), Indonesia (Kalimantan) and Brunei, which is encompassed by Sarawak. Located on the equator, it has a rainy humid equatorial climate. It has, however, high mountains, which provide many different habitats (Hazebroek & Morshidi 2001). In prehistoric times, Borneo was connected to the Asian mainland. To the East of the island is the so-called “Wallace line”, which separates the fauna and some of the flora of the Sunda shelf from that of the Sahul shelf (Merrill 1923). Due to the wide variety of plant species that developed earlier as a result of its isolation from the continent, Borneo is considered to be a center of biodiversity in tropical Asia.

Borneo, being part of the primary banana diversity center, has a large number of wild banana species. As banana plants prefer an open exposure, their growth is usually confined to rather small, isolated populations. They consequently manifest much genetic variation. Until the end of the 19th century, the island was covered with dense rain forests (Beccari 1902). Since then, the influence of man such as in agriculture, logging, etc., has led to much clearing of the forest, thereby allowing the wild banana populations to expand their growing area.

Wild *Musa* species are generally grouped into four sections. *Australimusa* ($2n = 20$), *Callimusa* ($2n = 20$), *Musa* ($2n = 22$) and *Rhodochlamys* ($2n = 22$). This paper focuses on *Musa lawitiensis*, which is classified in the *Callimusa* section (Cheesman 1947; Häkkinen 2004a).

Italian botanist Odoardo Beccari was the first to describe wild bananas from Borneo based on his studies in Sarawak during the period of 1865-1868 (Beccari 1902). He described and named four species: *Musa borneensis* Becc., *M. campestris* Becc., *M. hirta* Becc. and *M. microcarpa* Becc.

Japanese Mitsuru Hotta described three new species, *Musa flavida* M.Hotta., *M. muluensis* M.Hotta. and *M. tuberculata* M.Hotta based on his expeditions in Sabah, Brunei and Northern Sarawak during 1963-1964 (Hotta 1967).

N. W. Simmonds, who never visited Borneo, described *Musa beccarii* N.W.Simmonds from a cultivated plant in Trinidad, which he grew from seeds imported from Sabah (Simmonds 1960).

Rusdy E. Nasution, from the Herbarium Bogoriense, and Supardiyono, from Faculty of Biology, National University, Jakarta, described *Musa lawitiensis* Nasution & Supard. (Nasution & Supardiyono 1998).

George Argent from the Royal Botanical Garden, Edinburgh, described *Musa monticola* [M.Hotta ex] Argent and *M. suratii* Argent from Sabah (Argent 2000).

The author described five varieties of *Musa campestris* Becc. i.e. var. *lawasensis* Häkkinen, var. *limbangensis* Häkkinen, var. *miriensis* Häkkinen, var. *sabahensis* Häkkinen, var. *sarawakensis* Häkkinen and gave notes for the var. *campestris* (Häkkinen 2003, 2004b). Then the author described *Musa*

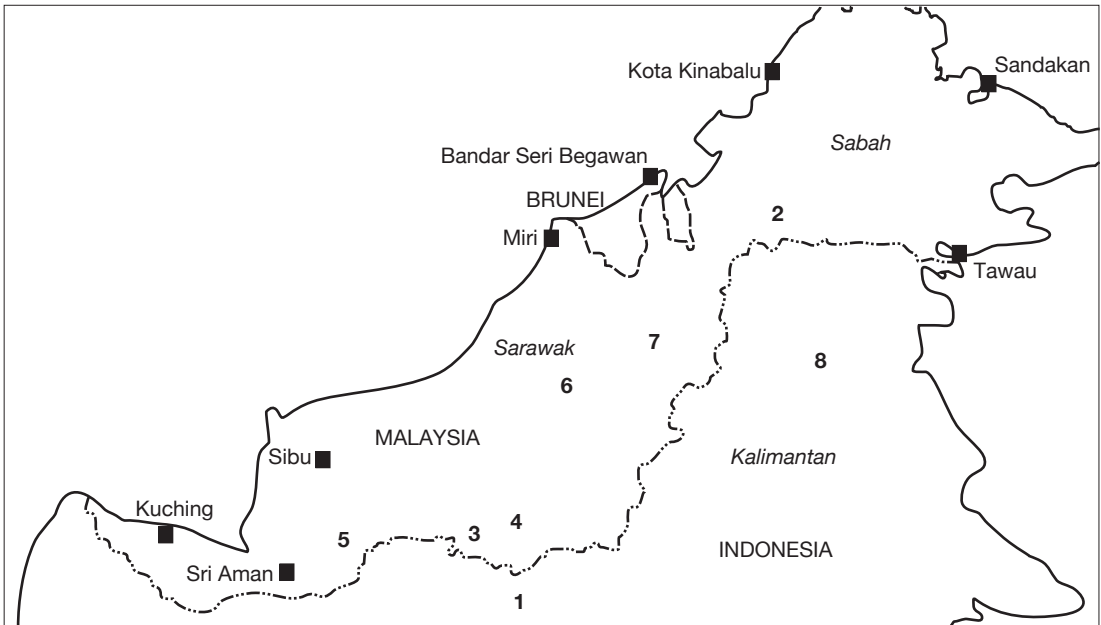


FIG. 2. — Distribution map of *Musa lawitiensis* Nasution & Supard. varieties: 1, 5-8, var. *lawitiensis*; 2, var. *suratii* (Argent) Häkkinen; 3, var. *kapitensis* Häkkinen; 4, var. *sarawakensis* Häkkinen. 1-4, author's field observations; 5-7, author's personal observation; 8, after Nasution & Supardiyono 1998.

voonii Häkkinen (Häkkinen 2004a), *Musa bauensis* Häkkinen & Meekiong (Häkkinen & Meekiong 2004), *Musa azizii* Häkkinen (Häkkinen 2005), *Musa beccarii* var. *hottana* Häkkinen (Häkkinen *et al.* 2005) and six varieties of *Musa borneensis* Becc. i.e. var. *alutacea* Häkkinen & Meekiong, var. *flavida* Häkkinen & Meekiong, var. *lutea* Häkkinen & Meekiong, var. *phoenicea* Häkkinen & Meekiong and var. *sarawakensis* Häkkinen & Meekiong (Häkkinen & Meekiong 2005).

Musa lawitiensis is similar in size and appearance to *Heliconia* species but it, however, mainly differs in addition to flowering habits that the leaves are spirally arranged compared to *Heliconia*, in which the leaves are oppositely arranged (Fig. 1). *Musa* species are native to Asia and, on the contrary, most *Heliconia* are from the Americas.

With the discovery of the new described *Musa* varieties, the number of native wild bananas has increased to 13 *Musa* species and 14 genetic varieties in Borneo. These figures include reducing the species status of *M. flavida* and *M. suratii* to the variety

level and excluding *Musa textilis* Née, which is an introduction in Borneo from the Philippines (Née 1801; Bishop & Curtler 1925; Marsh 1947).

This paper is based on extensive field observations made by the author during expeditions in 2001, 2002 and 2004 to Sarawak, Sabah, Brunei and West Kalimantan in Borneo.

These new varieties are described based on living plants in the field by completing the entire INIBAP *Musa* Descriptor List (IPGRI-INIBAP/CIRAD 1996). The descriptive terms here also follow the tradition of banana taxonomy as used by Simmonds (Simmonds 1962, 1966). Relevant parts of the specimens were deposited as a holotype at the herbarium of the Sarawak Forest Department herbarium Sarawak (SAR) and isotype at the herbarium of Universiti Malaysia Sarawak (HUMS). A chromosome number $2n = 20$ was determined by Jong & Argent (2001).

The complete descriptor list is available at University of Helsinki, Finland, as well as at the aforementioned centre.

KEY TO THE VARIETIES OF *MUSA LAWITIENSIS* NASUTION & SUPARD.

1. Plant 3.5 m or less; pseudostem underlying colour green; colour of leaf upper surface green and lower surface medium green 1. var. *lawitiensis*
- Plant more than 3.5 m; pseudostem underlying colour yellowish, colour of leaf upper surface light green and lower surface watery green 2
2. Colour of leaf upper surface light green and lower surface watery green; peduncle colour purple-brown; male bud orange pink with sharp apex 2. var. *suratii*
- Colour of leaf upper surface silvery and lower surface light green; male bud orange-red with obtuse apex 3
3. Female bud colour orange to red; basal flowers hermaphrodite; male flowers 5-8 per bract in two rows; compound tepal apex 3-toothed 3. var. *kapitensis*
- Female bud colour bright yellow; basal flowers female; male flowers 5 per bract in one row; compound tepal apex 5-toothed 4. var. *sarawakensis*

SYSTEMATICS

1. *Musa lawitiensis* Nasution & Supard.
var. *lawitiensis*
(Fig. 3A)

Musa lawitiensis Nasution & Supard., *Bulletin Kebun Raya Indonesia* 8 (4): 128, fig. 1A-K (1998).

TYPE. — **Indonesia**. West Kalimantan, Bentuan Karimun National Park, I.1997, *Supardiyono JN-TNBK 11* (holo-, BO; iso-, BO).

LIVING SPECIMEN EXAMINED AND DESCRIBED HERE. — **Indonesia**. West Kalimantan, Bentuan Karimun National Park, river Sibau, 243 m alt., 00°26.182'N, 112°32.389'E, 4.XI.2002.

DESCRIPTION

Plant slender, suckering freely, close to parent plant, up to 4 suckers, position vertical. Mature pseudostem up to 3.1 m high, sheaths red-purple, underlying colour light green with purple blotches, shiny, sap watery. Petiole up to 14 cm long, petiole margins curved inward, petiole bases winged and clasping the pseudostem, margins curved inward with extensive brown-black blotches. Leaf habit drooping, lamina 125 cm long, 22 cm wide, narrowly elliptic, truncate at the apex, colour of upper surface green, lower surface medium green, appearance dull, heavily waxy on either surface, leaf bases asymmetric and both sides pointed, midrib dorsally green, ventrally yellow, with very corrugated lamina. Inflorescence

hanging vertically downwards, peduncle 9 cm long, 3.5 cm in diameter, hairless and light green in colour, sterile bract 1 with small orange-red foliage lamina, deciduous at the opening of the first female flowers. Female bud, slender, 24 cm long, 4 cm wide, orange to red, pruinose with wax outside, imbricate, lifting several bracts at a time, not revolute before falling. Basal flowers hermaphrodite 8 cm long, the ovary yellowish, arrangement of ovules in two rows per loculus, the compound tepal 2.5 cm long, with two prominent thickened keels hyaline margins, green in colour, the lobes dark green, free tepal 2.3 cm long, boat-shaped, 5 cm long, translucent white, stamens 5 with fertile pollen, the style 2.7 cm long, cream stigma 0.3 cm in diameter. Male bud, lanceolate, 11 cm long, 3.5 cm wide, orange-red in colour, pruinose with wax outside, imbricate with obtuse purplish apex, lifting one bract at a time, not revolute before falling. Male flowers on average 6-8 per bract in 2 rows, falling with the bract, compound tepal 3.5 cm long, light yellow, ribbed at the dorsal angles, with 3-toothed green-yellow apex, the central lobe smaller than the outer lobes, free tepal 2.5 cm long, translucent white, oval, smooth, with triangular apex, stamens 5, filaments white, anthers yellow, anthers and style exerted, stigma orange, ovary straight, yellow, without pigmentation. Fruit bunch lax, with 8 hands and 5-8 fruits per hand on average, in 1-2 rows, fingers slightly curved towards to the stalk, individual fruit 8 cm long, slightly curved, rounded, pedicel 9 mm long,

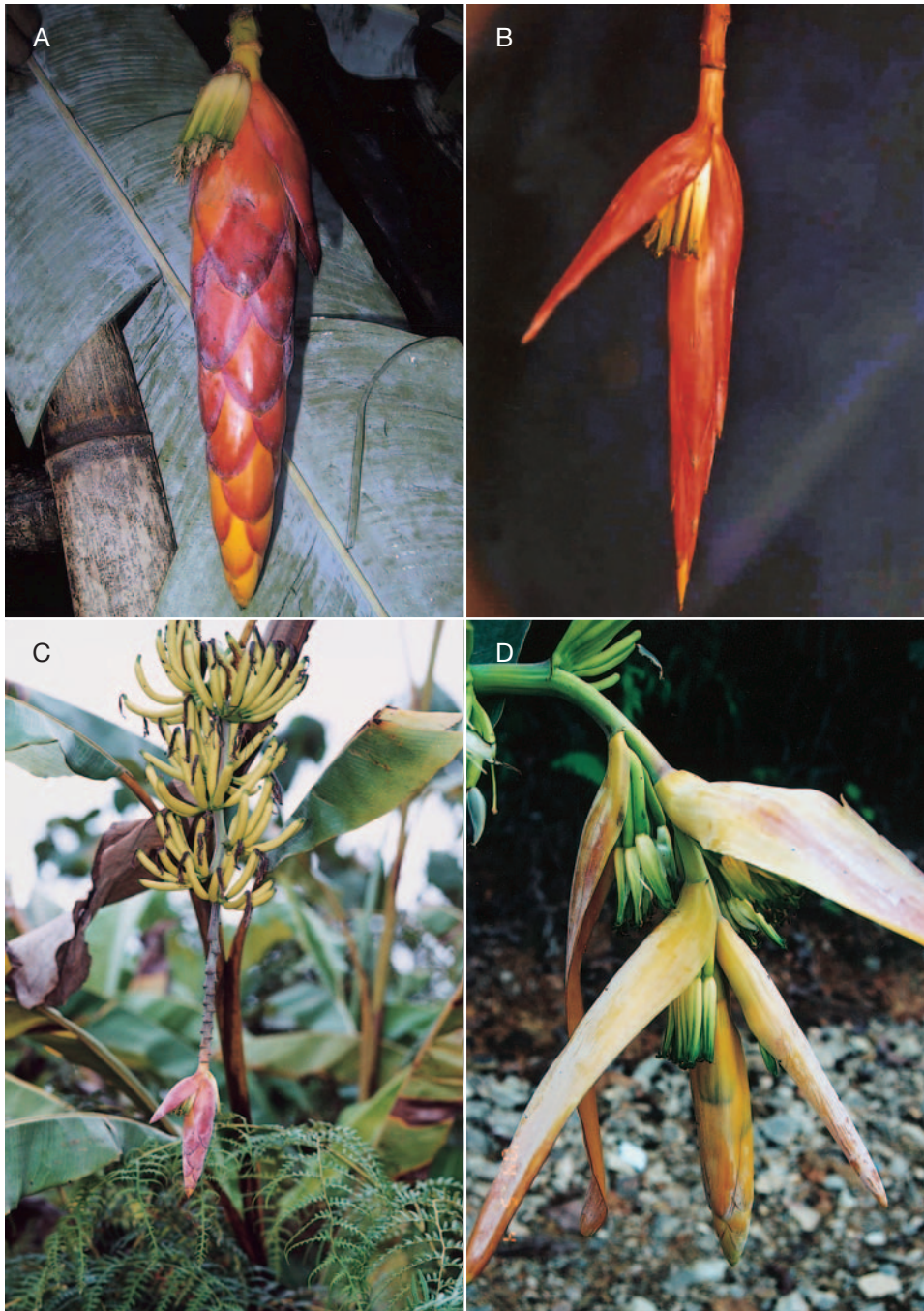


FIG. 3. — **A**, *Musa lawitiensis* Nasution & Supard. var. *lawitiensis*, male bud; **B**, *Musa lawitiensis* var. *suratii* (Argent) Häkkinen, male bud; **C**, *Musa lawitiensis* var. *kapitensis* Häkkinen, inflorescence; **D**, *Musa lawitiensis* var. *sarawakensis* Häkkinen, female bud with female basal flowers.

fruit apex bottle-necked shaped, without any floral relict, immature peel colour pale yellow becoming yellow at maturity, immature fruit pulp white, becoming white and soft at maturity. Seeds nearly rounded, tuberculate, about 1.5 mm in diameter, 60-70 seeds per fruit.

DISTRIBUTION

Musa lawitiensis var. *lawitiensis* abundantly grows on river banks in the Bentuan Karimun National Park at altitudes of over 200 m.

VERNACULAR NAMES

Pisang hutan, Pisang junai.

2. *Musa lawitiensis* Nasution & Supard.
var. *suratii* (Argent) Häkkinen, stat. nov.
(Fig. 3B)

Musa suratii Argent, *Garden's Bulletin Singapore* 52: 77, fig. 1A-P (2000).

TYPE. — **Malaysia**. Sabah, Kallang, Tenom District, 8.IX.1989, *Surat & Lamb* 268/89 (holo-, SAN; iso-, E).

LIVING SPECIMEN EXAMINED AND DESCRIBED HERE. — **Malaysia**. Sabah, Tenom district, 773 m alt., 04°28.838'N, 114°51.781'E, 19.X.2002.

ADDITIONAL LIVING SPECIMENS EXAMINED. — **Malaysia**. Sarawak, Kapit division, 137 m alt., 01°38.949'N, 113°07.866'E, 4.V.2004. — Same data, 138 m alt., 01°48.176'N, 113°06.116'E, 4.V.2004. — Same data, 68 m alt., 01°56.242'N, 113°00.5786'E, 5.V.2004.

DESCRIPTION

Plant slender, suckering freely, close to parent plant, up to 7 suckers, position vertical. Mature pseudostem up to 3.5 m high, sheaths dark purplish black, underlying colour yellowish with purple blotches, shiny, sap watery. Petiole up to 11 cm long, petiole margins curved inward, petiole bases winged and clasping the pseudostem with slightly corrugated auricles with purple blotches. Leaf habit drooping, lamina 140 cm long, 20 cm wide, narrowly elliptic, truncate at the apex, colour of upper surface light green, lower surface watery-green, appearance dull, heavily waxy on either surface, leaf bases asymmet-

ric and both sides pointed, midrib dorsally orange in colour, ventrally yellow, with very corrugated lamina. Inflorescence hanging vertically downwards, peduncle 14 cm long, 3.5 cm in diameter, slightly waxy, hairless and purple-brown in colour, sterile bract 1 with small orange to pink foliage lamina, deciduous at the opening of the first female flowers. Female bud, slender, 26 cm long, 4 cm wide, orange to pink, pruinose with wax outside, imbricate, lifting several bracts at a time, not revolute before falling. Basal flowers hermaphrodite 9 cm long, the ovary cream, arrangement of ovules in two rows per loculus, the compound tepal 2.7 cm long, with two prominent thickened keels hyaline margins, lower part paler green upper green in colour, free tepal 2.3 cm long, boat shaped, 5 cm long, translucent white, stamens 5 with fertile pollen, the style 2.7 cm long, cream stigma 0.3 cm in diameter. Male bud, slender with sharp apex, 14 cm long, 2.2 cm wide, orange-pink in colour, pruinose with wax outside, imbricate with sharp green apex, lifting one bract at a time, not revolute before falling. Male flowers on average 4-6 per bract in 1 row, falling with the bract, compound tepal 2.8 cm long, yellowish, ribbed at the dorsal angles, with 3-toothed greenish apex, the central lobe smaller than the outer lobes, free tepal 2.5 cm long, translucent white, three-pointed the lateral points broad, the central point smaller, firmer with greenish yellow apex, stamens 5, filaments white, anthers creamy white, anthers and style at the same level, stigma cream, ovary straight, yellow, without pigmentation. Fruit bunch lax, with 10 hands and 5-8 fruits per hand on average, in 2 rows, fingers curved upwards towards the stalk, individual fruit 10 cm long, slightly curved, rounded, pedicel 6 mm long, fruit apex bottle-necked shaped remaining light green at maturity, without any floral relict, immature peel colour pale green becoming yellow at maturity, immature fruit pulp white, becoming soft and creamy at maturity. Seeds tiny, ovoid, without any tubercles, about 1 mm in diameter, 90-100 seeds per fruit.

DISTRIBUTION

This population was along the logging road consisting only eight separate plants and was the only one known location in Sabah.

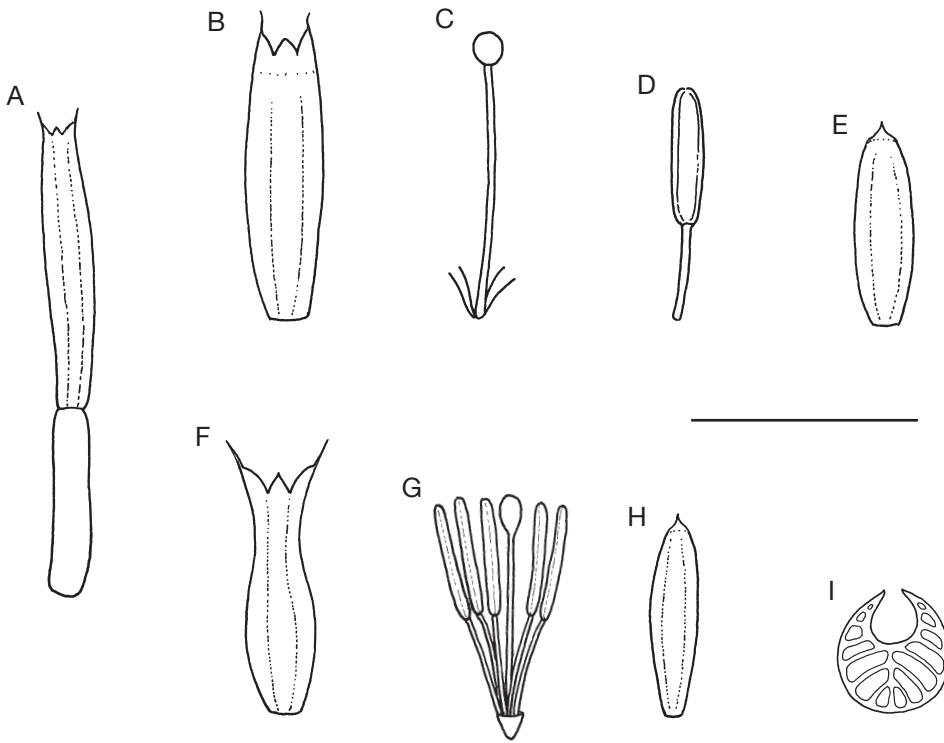


FIG. 4. — *Musa lawitiensis* Nasution & Supard. var. *kapitensis* Häkkinen: **A**, hermaphrodite flower with ovary; **B**, compound tepal of hermaphrodite flower; **C**, style with stigma; **D**, staminode with anther; **E**, free tepal of hermaphrodite flower; **F**, compound tepal of male flower; **G**, stamens with pistil; **H**, free tepal of male flower; **I**, cross-section of petiole. *M. Häkkinen et al.* 1997. Scale bar: 3 cm.

3. *Musa lawitiensis* Nasution & Supard.
var. *kapitensis* Häkkinen, var. nov.
(Figs 3C; 4)

A specie typica permultis surculis, vaginis foliorum flavo-brunneis, succo lacteo ac non aqueo, foemino alabastro extus valde ceraceo cum unica bractea simul erecta atque permultis quidem 10 fructibus per racemi manum praecipue differt.

TYPE. — Malaysia. Sarawak, Kapit division, 242 m alt., 01°50.960'N, 113°02.759'E, 4.V.2004, Häkkinen *M. et al.* 1997 (holo-, SAR; iso-, HUMS).

DESCRIPTION

Plant slender, suckering freely, close to parent plant, clumping up to 20 suckers, position near vertical. Mature pseudostem up to 1.8 m high, sheaths yellow-brown, underlying colour yellow-green with purple blotches, dull, sap milky. Petiole up to 25 cm

long, petiole margins curved inward, petiole bases winged and clasping the pseudostem with brown-black blotches. Leaf habit drooping, lamina 140 cm long, 22 cm wide, narrowly elliptic, truncate at the apex, colour of upper surface silvery, lower surface light green, appearance dull, heavily waxy on either surface, leaf bases asymmetric and both sides pointed, midrib dorsally light green, ventrally bright yellow, with very corrugated lamina. Inflorescence hanging vertically downwards, peduncle 13 cm long, 1.2 cm in diameter, hairless and medium-green in colour, sterile bract 1 with small orange-red foliage lamina with small leaf like green tip, deciduous at the opening of the first female flowers. Female bud, slender, 25 cm long, 4 cm wide, orange to red, heavily waxy outside, imbricate, lifting one bract at a time, not revolute before falling. Basal flowers hermaphrodite 8 cm long, the ovary pale yellow,

arrangement of ovules in two rows per loculus, the compound tepal 3 cm long, with two prominent thickened keels hyaline margins, green in colour upper part, yellow in lower part, the 4 lobes dark green, free tepal 2.3 cm long, boat shaped, translucent white with green triangular tip, the style 3 cm long, cream stigma 0.3 cm in diameter. Male bud, lanceolate, 9 cm long, 3.3 cm wide, orange-red in colour, moderate waxy outside, imbricate with obtuse dark red apex, lifting one bract at time, not revolute before falling. Male flowers on average 5-8 per bract in 2 rows, falling usually after the bract, compound tepal 3.5 cm long, light yellow, ribbed at the dorsal angles, with 3-toothed green apex, the central lobe smaller than the outer lobes, free tepal 2.8 cm long, translucent white, oval, smooth, with green triangular apex, stamens 5, filaments cream, anthers cream, anthers and style at the same level, stigma light green, ovary arched, cream, without pigmentation. Fruit bunch lax, with 7 hands and 10-12 fruits per hand on average, in 2 rows, fingers curved slightly towards to the stalk, individual fruit 8.5 cm long, slightly curved, rounded, pedicel 8 mm long, fruit apex bottle-necked shaped, with floral relict, immature fruit peel colour pale yellow and becoming yellow at maturity, immature fruit pulp white, becoming soft and creamish at maturity. Seeds tiny, ovoid, with some tubercles, about 1.2 mm in diameter, 80-90 seeds per fruit.

DISTRIBUTION

Musa lawitiensis var. *kapitensis* abundantly grows on river banks of the river Mengiong in Sarawak's side of the Mount Lawit.

4. *Musa lawitiensis* Nasution & Supard. var. *sarawakensis* Häkkinen, var. nov. (Figs 3D; 5)

A specie typica vaginis foliorum viridulis, foemino alabastro laete flavo, basalibus floribus foemineis ac non hermaphroditis, masculinis floribus 5 per bracteam in unica serie dispositis, cum tepalo composito 5-dentato atque fructuum racemo extantum 4 manibus constante praecipue differt.

TYPE. — **Malaysia.** Sarawak, Kapit division, 712 m alt., 01°42.012'N, 113°05.451'E, 4.V.2004, Häkkinen M. et al. 997-1 (holo-, SAR; iso-, HUMS).

DESCRIPTION

Plant slender, suckering freely, close to parent plant, clumping up to 6 suckers, position near vertical. Mature pseudostem up to 2 m high, sheaths greenish, underlying colour light green with small purple blotches, dull, watery. Petiole up to 30 cm long, petiole margins overlapping, petiole bases winged and clasping the pseudostem with small black blotches. Leaf habit drooping, lamina 170 cm long, 23 cm wide, narrowly elliptic, truncate at the apex, colour of upper surface dark green, lower surface green, appearance dull, waxy on either surface, leaf bases asymmetric and both sides pointed, midrib dorsally light green, ventrally green-yellow, with very corrugated lamina. Inflorescence hanging vertically downwards, peduncle 30 cm long, 2 cm in diameter, hairless, waxy and silvery green in colour, sterile bract 1 with small bright yellow foliage lamina, deciduous at the opening of the first female flowers. Female bud, slender, 23 cm long, 4 cm wide, bright yellow, heavily waxy outside, imbricate, lifting several bracts at a time, not revolute before falling. Basal flowers female 6.5 cm long, the ovary greenish yellow, arrangement of ovules in two rows per loculus, the compound tepal 3.6 cm long, with two prominent thickened keels hyaline margins, green in colour upper part, pale yellow in lower part, the 3 lobes dark green, free tepal 2.7 cm long, boat shaped, white with green triangular tip, the style 3.4 cm long, whitish stigma 0.3 cm in diameter. Male bud, slender with sharp apex, 13 cm long, 2.5 cm wide, orange to yellow in colour, with wax outside, imbricate with obtuse dark red apex sharp green apex, lifting one bract at a time, not revolute before falling. Male flowers on average 5 per bract in 1 row, falling with the bract, compound tepal 3.7 cm long, cream in lower and green in upper part, ribbed at the dorsal angles, with 5-toothed green apex, the 3 central lobes are smaller than the outer lobes, free tepal 3 cm long, translucent white, oval, smooth, with green triangular apex, stamens 5, filaments cream, anthers brown, anthers and style inserted, stigma light green, ovary straight, cream, without pigmentation. Fruit bunch lax, with 4 hands and 8-10 fruits per hand on average, in 2 rows, fingers curved slightly towards to the stalk, individual fruit 8.5 cm long, slightly curved, rounded, pedicel 6 mm

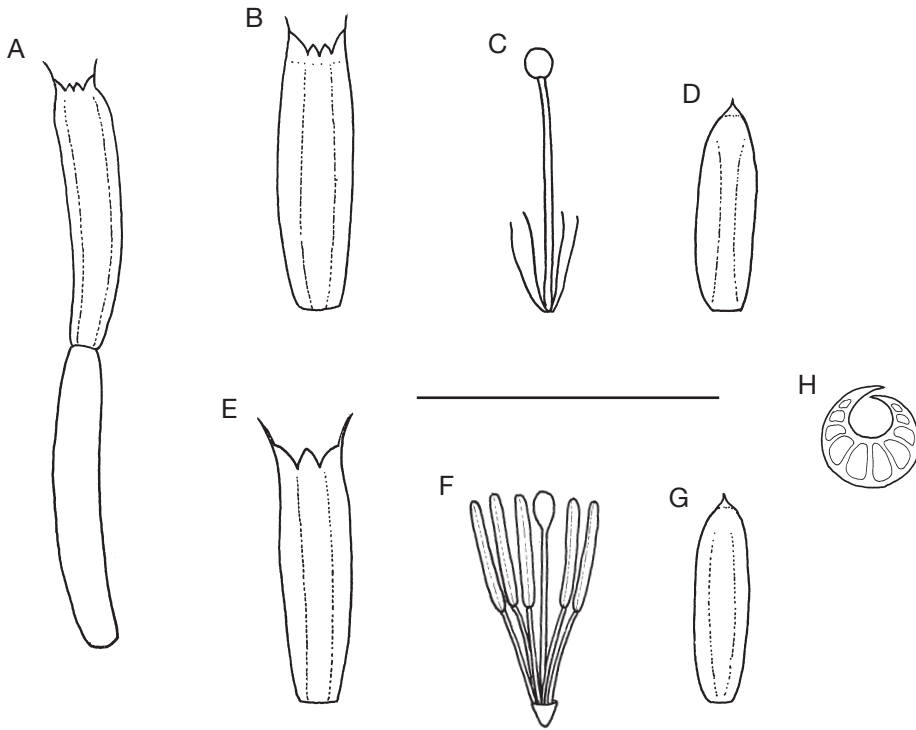


FIG. 5. — *Musa lawitiensis* Nasution & Supard. var. *sarawakensis* Häkkinen: **A**, female flower with ovary; **B**, compound tepal of female flower; **C**, style with stigma; **D**, free tepal of female flower; **E**, compound tepal of male flower; **F**, stamens with pistil; **G**, free tepal of male flower; **H**, cross-section of petiole. *M. Häkkinen et al. 997-1*. Scale bar: 4 cm.

long, fruit apex bottle-necked shaped, without any floral relict, immature fruit peel colour light green and becoming yellow at maturity, immature fruit pulp white, becoming soft and creamish at maturity. Seeds tiny, ovoid, with some tubercles, about 1.2 mm in diameter, 85-90 seeds per fruit.

DISTRIBUTION

This population was along the logging road consisting of only 15 separate plants and was the only population that we could locate in the area.

ADDITIONAL UNIDENTIFIED SPECIMENS OF *MUSA LAWITIENSIS* VARIETIES (FIG. 2)

5. **Malaysia.** Sarawak, Sri Aman division, Lubok Andu, river Delok, *Christensen 1066* (AAU, E, SAR).

6. **Malaysia.** Sarawak, Bintulu division, Long Murum, *Leng Guan* (KEP).

7. **Malaysia.** Sarawak, Miri division, Usum Apau, *Ruth Kiew* (SING).

8. **Indonesia.** East Kalimantan, West Kutai, 1600 m alt., *M. Kato H. Wiriadinata B-6207* (KYO).

CONCLUSION

Four distinct varieties of *M. lawitiensis* have been described by the author: *lawitiensis*, *kapitiensis*, *sarawakensis* and *suratii*. The distinguishing characteristics of each variety are shown in Table 1. It has become very clear during this study that *M. lawitiensis* is a higher altitude species, which has evolved into several different varieties in Borneo. The *M. lawitiensis* populations are growing in isolated gaps in the mountainous valleys, which have caused the genetic variation within the species.

TABLE 1. — Differentiating the main characteristics of *Musa lawitiensis* Nasution & Supard. varieties.

	<i>var. lawitiensis</i>	<i>var. suratii</i> (Argent) Häkkinen	<i>var. kapitensis</i> Häkkinen	<i>var. sarawakensis</i> Häkkinen
Figures	3A	3B	3C; 4	3D; 5
Plant height	3.1 m	3.5 m or more	1.8 m	2 m
Number of suckers	up to 4	up to 7	up to 20	up to 6
Pseudostem appearance	Shiny (not waxy), slender	shiny (not waxy), slender	shiny (not waxy), slender	dull (waxy), slender
Underlying colour of the pseudostem	light green	yellowish	yellow-green	light green
Pigmentation of the underlying pseudostem	purple blotches	purple blotches	purple blotches	small purple blotches
Wax on the pseudostem	shiny	shiny	waxy	waxy
Sap colour	watery	watery	milky	watery
Petiole canal leaf	margins curved inwards	margins curved inwards	margins curved inwards	margins overlapping
Colour of leaf upper surface	green	light green	silvery	dark green
Appearance of leaf upper surface	heavily waxy	heavily waxy	heavily waxy	waxy
Colour of leaf lower surface	medium green	watery green	light green	green
Colour of midrib dorsal surface	green	orange	light green	light green
Colour of midrib ventral surface	yellow	yellow	bright yellow	green-yellow
Peduncle colour	light green	purple-brown	medium green	silvery green
Female bud shape	slender 24 × 4 cm	slender 26 × 4 cm	slender 25 × 4 cm	slender 23 × 4 cm
Female bud colour	orange to red	orange to pink	orange to red	bright yellow
Female bract lifting	lifting several bracts at a time	lifting several bracts at a time	lifting one bract at a time	lifting several bracts at a time
Basal flowers	basal flowers hermaphrodite	basal flowers hermaphrodite	basal flowers hermaphrodite	basal flowers female
Female flowers compound tepal	2.5 cm long, green to dark green at apex	2.7 cm long, pale green to green at apex	3 cm long, yellow to dark green at apex	3.6 cm long, pale yellow to dark green at apex
Male bud shape	lanceolate, 11 × 3.5 cm	slender with sharp apex, 14 × 2.2 cm	lanceolate, 9 × 3.3 cm	slender with sharp apex, 13 × 2.5 cm
Colour of the bract external face	orange-red	orange-pink	orange-red	orange-yellow
Bract apex	with obtuse purplish	sharp with green tips	with obtuse dark red	with obtuse dark red
Flowers per bract	6-8 in two rows	4-6 in one row	5-8 in two rows	5 in one row
Male flowers compound tepal	3.5 cm long, light yellow to green-yellow at apex	2.8 cm long, yellowish to greenish at apex	3.5 cm long, light yellow to green at apex	3.7 cm long, cream to green at apex
Compound tepal apex shape	3-toothed	3-toothed	3-toothed	5-toothed
Anther and style exertion	exserted	at the same level	at the same level	inserted
Stigma colour	orange	cream	light green	light green
Ovary shape and colour	straight, yellow	straight, yellow	arched, cream	straight, cream
Number of fruits	8 hands, 5-8 fruits per hand	10 hands, 5-8 fruits per hand	7 hands, 10-12 fruits per hand	4 hands, 8-10 fruits per hand
Fruit peel colour	yellow at maturity	light green at maturity	pale yellow at maturity	yellow at maturity
Number of seeds per fruit	60-70	90-100	80-90	85-90

The species itself has been considered very rare and little known in the scientific world up to the present because the remote areas had not been explored earlier.

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