

## TWO NEW SPECIES OF *AMOMUM* (ZINGIBERACEAE) FROM WESTERN GHATS, INDIA

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Two new species of *Amomum*, *A. agastyamalayanum* V.P.Thomas & M.Sabu and *A. newmanii* M.Sabu & V.P.Thomas (Zingiberaceae), from the Western Ghats of Kerala are described and illustrated. Their distribution, ecology, IUCN status, etymology and similarities to related taxa are also discussed.

*Keywords.* *Amomum*, India, Kerala, new species, Western Ghats, Zingiberaceae.

### INTRODUCTION

*Amomum* Roxb. is the second largest genus in the Zingiberaceae (after *Alpinia* Roxb.), with about 150–180 species, and is widely distributed in Southeast Asia (Xia *et al.*, 2004). In India the members of the genus are mainly distributed in NE India, Peninsular India and the Andaman–Nicobar Islands. Sabu (2006) reported six species of *Amomum* from South India. Thomas *et al.* (2009) and Thomas *et al.* (2012) added *Amomum fulviceps* Thwaites and *A. nilgircum* V.P.Thomas & M.Sabu respectively from the Western Ghats. During a revision of Indian Zingiberaceae the authors collected two interesting specimens of *Amomum* from Agastyamalay in the Western Ghats and after critical study they proved to be new species. These species are described and illustrated here. The total number of species of *Amomum* in South India is thus raised to 10.

*Amomum agastyamalayanum* is allied to *A. ghaticum* K.G.Bhat of South India (Table 1). *Amomum newmanii* is similar to *A. masticatorium* Thwaites (Table 2).

The length/breadth ratio of the rhizome was determined by calculating the average length of the rhizome between two leafy shoots/average thickness of the rhizome.

### SPECIES DESCRIPTIONS

#### ***Amomum agastyamalayanum* V.P.Thomas & M.Sabu, sp. nov. Figs 1, 3.**

*Amomum agastyamalayanum* is allied to *A. ghaticum* K.G.Bhat of South India in having similar small and yellow flowers, but differs from the latter in its smaller,

TABLE 1. Comparison of *Amomum ghaticum* and *A. agastyamalayanum*

Character	<i>A. ghaticum</i>	<i>A. agastyamalayanum</i>
Habit	200–450 cm tall, clump forming	90–170 cm tall, diffuse
Rhizome	Non-stoloniferous, length/breadth ratio c.3	Stoloniferous, length/breadth ratio c.20
Lamina	Lanceolate to oblong-lanceolate, 38–51 × 5.5–10 cm, tomentose beneath, veins raised above	Lanceolate, 22–33 × 3.5–4.5 cm, glabrous, veins flat above
Petiole	0.7–1.5 cm long	0–0.2 cm long
Bract	Maroon	Pale green tinged with pink
Spike	5–7 × 3–4 cm	3–6 × 1.5–2 cm
Flower	2.5–3.4 cm long	1.8–2 cm long
Capsule	2–3 × 2–3 cm	1.1–2 × 1.1–1.6 cm

diffuse habit, slender and stoloniferous rhizome, glabrous leaves with flat veins, shape and size of the lamina, smaller size of the petiole, slender inflorescence, and smaller flowers and fruits. – Type: India, Kerala, Thiruvananthapuram Dist., Agastyamalay, Athirumala, 2 iii 2008, *V.P. Thomas & A.V. Prasanth* 103039 (holo CALI; iso CAL, MH).

*Rhizome* stoloniferous, slender, 0.5–1.2 cm thick, length/breadth ratio c.20, creamy-white inside, covered with scales; scales triangular, chartaceous, margin ciliate, apex acute to rounded, glabrous on both surfaces. *Leafy shoots* 90–170 cm tall, slender, diffuse; sheath c.2.5 cm wide at base, green, margin membranous, glabrous on both surfaces. *Leaves* 8–23 per shoot; lamina lanceolate, 22–33 × 3.5–4.5 cm, dark green above, pale beneath, base cuneate, margin glabrous, apex acuminate and curled,

TABLE 2. Comparison of *Amomum masticatorium* and *A. newmanii*

Character	<i>A. masticatorium</i>	<i>A. newmanii</i>
Habit	Diffuse	Clump forming
Rhizome	Stoloniferous, length/breadth ratio c.45	Non-stoloniferous, length/breadth ratio c.3
Ligule	Apex acuminate	Apex rounded
Flower	Deep yellow	Pale yellow
Labellum	3–3.5 × 2.3–2.8 cm	2.5–2.9 × 2–2.4 cm
Infructescence	3–6.5 cm long; peduncle 4–5 cm long	15–17 cm long; peduncle 11–14 cm long
Fruit	1.5–2.4 × c.1.5 cm, dark maroon	2.2–2.5 × 2.2–2.5 cm, green

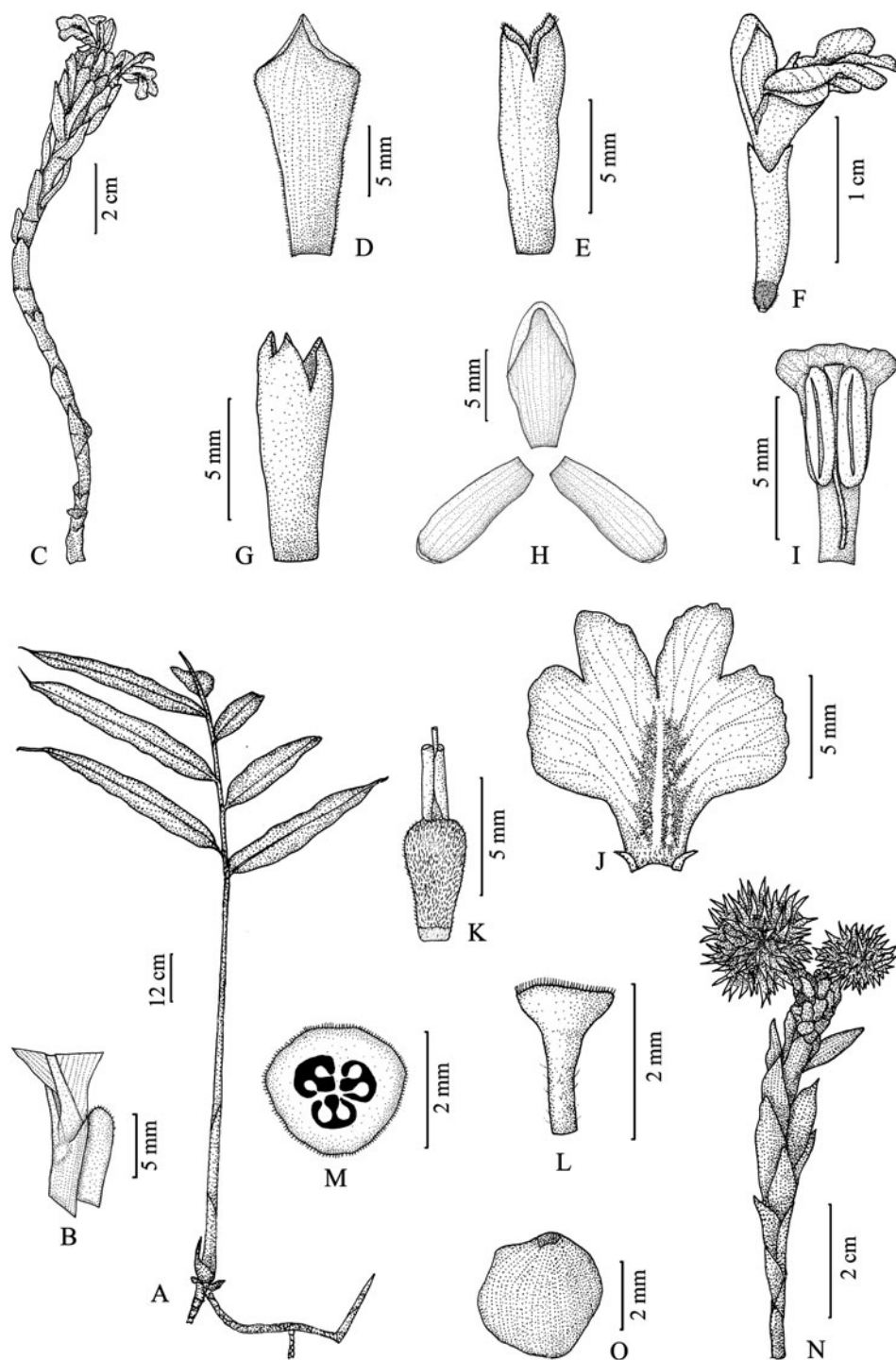


FIG. 1. *Amomum agastyamalayanum* V.P.Thomas & M.Sabu. A, habit; B, ligule; C, inflorescence; D, bract; E, bracteole; F, flower; G, calyx; H, corolla lobes; I, stamen; J, labellum; K, ovary with epigynous glands and style; L, stigma; M, c.s. of ovary; N, infructescence; O, seed.

glabrous on both surfaces; midrib glabrous; veins flat above; petiole 0–0.2 cm long, green, glabrous. *Ligule* entire, 0.3–0.5 cm long, green tinged with pink, coriaceous, margin ciliate, apex rounded, glabrous. *Inflorescence* 7–23 × 1.5–2 cm, many-flowered, arising from the rhizome underground; peduncle 4–17 cm long. *Bract* obovate to obovate-oblong, 1.2–1.7 × 0.5–0.9 cm, pale green tinged with pink, coriaceous, margin ciliate, apex acute, puberulous towards base externally, glabrous internally. *Bracteole* tubular, 0.9–1.2 × 0.2–0.3 cm, equally 2-lobed, membranous, pale green tinged with pink, unilaterally split, margin ciliate, pubescent externally, glabrous internally. *Flower* 1.8–2 cm long, yellow. *Calyx* 2- or 3-lobed, ecuspidate, 0.9–1 × 0.25–0.3 cm, pale green tinged with pink, unilaterally split, pubescent towards base and apex externally, glabrous internally. *Corolla* tube 0.8–0.9 cm long, c.0.2 cm wide at mouth, pale yellow, pubescent externally, villous towards mouth within and glabrous towards base; dorsal corolla lobe oblanceolate, c.1.1 × 0.5 cm, pale yellow with pink-tinged apex, margin ciliate towards base, apex hooded and ecuspidate, puberulous towards apex externally, glabrous internally; lateral corolla lobes oblong, c.1 × 0.3 cm, pale yellow, margin ciliate towards base, puberulous towards apex externally, glabrous internally. *Labellum* obovate, 3-lobed with cleft midlobe, 1.3–1.6 × 1.2–1.4 cm, pale yellow towards periphery and dark towards centre, with a red patch in the throat, margin entire, pubescent towards base internally. *Lateral staminodes* small, subulate, c.0.1 cm long, yellow, glabrous. *Stamen* 0.7–0.9 cm long; filament 0.2–0.3 × c.0.1 cm, pale yellow, puberulous; connective glabrous; crest fan-shaped, slightly lobed, c.0.1 × 0.35–0.45 cm, pale yellow, glabrous; anther thecae oblong, 0.35–0.4 cm long, creamy-white, base rounded, apex rounded, pubescent; dehiscing throughout their length. *Epigynous glands* 2, oblong, 0.3–0.4 cm long, cream coloured, apex slightly lobed, glabrous. *Ovary* ovate-oblong, c.0.4 × 0.3 cm, pubescent externally; locules 3; ovules many on axile placentae; style c.1.5 cm long, pubescent; stigma cup-shaped, c.0.05 cm across, white, mouth ciliate, opening terminal. *Infructescence* 8–14 cm long; peduncle 6–10 cm long, 3–7 capsules per spike. *Capsule* globose to slightly oblong, 1.1–2 × 1.1–1.6 cm, echinate, red to maroon, calyx persistent. *Seeds* many, angular, 0.4–0.5 × 0.3–0.4 cm, black, aromatic, arillate; aril white.

*Distribution.* Agastyamalay hills, Kerala. The plant has a stoloniferous rhizome and is found in small patches spreading over a small area.

*Ecology.* Found growing as undergrowth in evergreen forest at 900–1300 m altitude. Flowering and fruiting: February–July.

*Proposed IUCN conservation status.* Critically Endangered CR B1ab(i,ii,iii)+B2ab(i,ii,iii) (IUCN, 2001). This species is known only in Agastyamalay. A continuing decline is projected in the extent of occurrence, the area of occupancy and the quality of habitat due to continuous human interference. The area receives a great deal of foot traffic, especially during the pilgrimage season, which may damage the existing population. Mass collection of these plants, along with similar plants, for thatching of

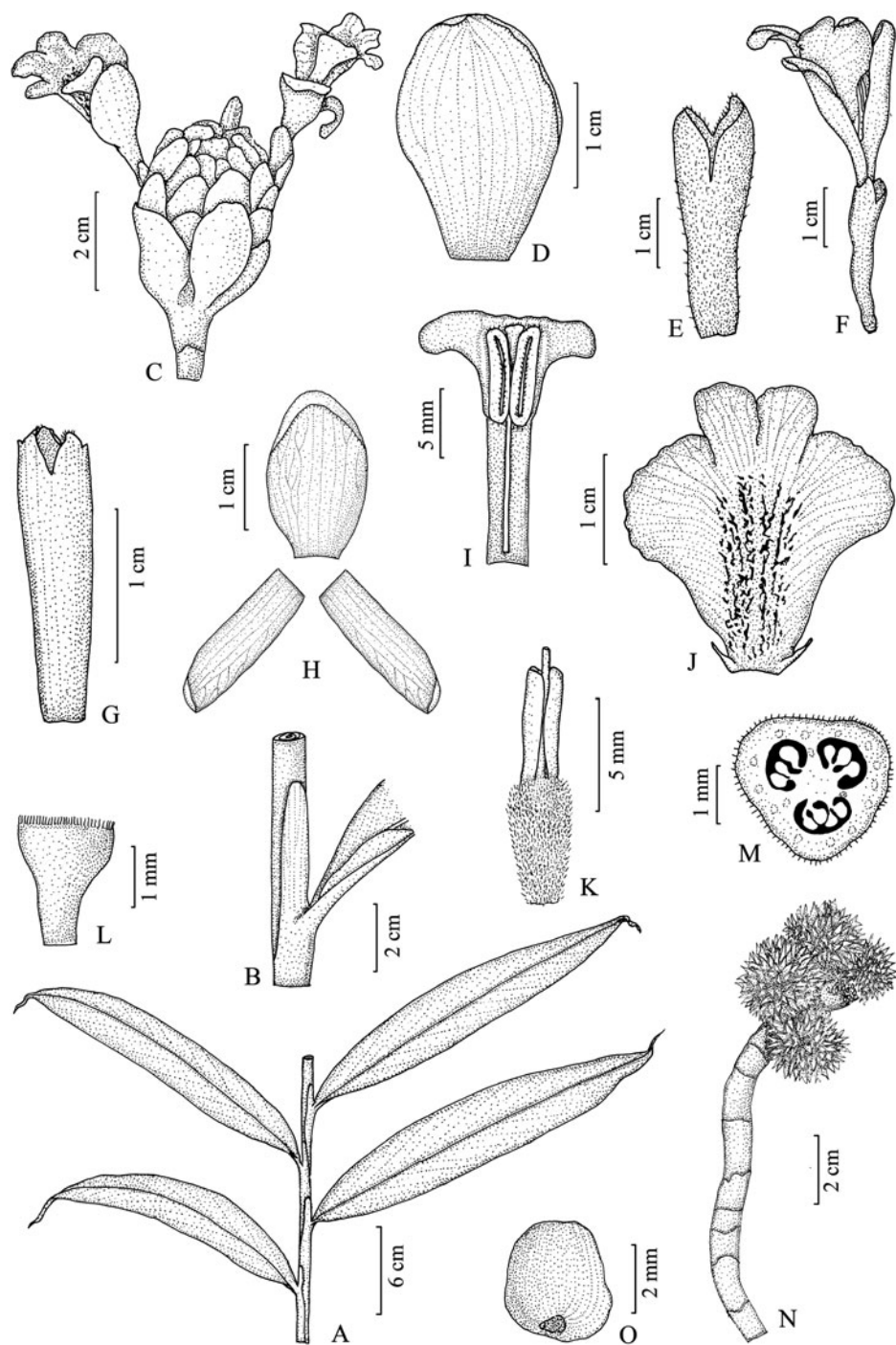


FIG. 2. *Amomum newmanii* M.Sabu & V.P.Thomas. A, part of leafy shoot; B, ligule; C, inflorescence; D, bract; E, bracteole; F, flower; G, calyx; H, corolla lobes; I, stamen; J, labellum; K, ovary with epigynous glands and style; L, stigma; M, c.s. of ovary; N, infructescence; O, seed.



temporary sheds is also a threat to the population. The species is habitat specific and found only above 900 m.

*Etymology.* The specific epithet 'agastyamalayanum' indicates the place of collection, Agastyamalay.

*Additional specimens examined.* INDIA. **Kerala:** Thiruvananthapuram Dist.: Agastyamalay, Athirumala, c.1000 m, 1 iv 1989, *N. Mohanan* 5511 (TBGT); *ibid.*, 12 vii 1999, *M. Dan* 36229 (TBGT); way to Meenmutty, 1200 m, 27 ii 1991, *N. Mohanan* 10401 (CALI, TBGT); Athirumala, 6 ii 1991, *N. Mohanan* 9427 (CALI, TBGT); near Attayar, 7 ii 2006, *E. Sanoj* 86182 (CALI); Athirumala, *E. Sanoj* 86192 (CALI); Agastyamalay, near Athirumala, 2 iii 2008, *V.P. Thomas & A.V. Prasanth* 103024 (CALI).

***Amomum newmanii* M.Sabu & V.P.Thomas, sp. nov. Figs 2, 3.**

*Amomum newmanii* is similar to *A. masticatorium* Thwaites in having a long ligule and trilobed labellum with a cleft midlobe and echinate capsule, but differs from it in the stout, clump-forming habit, non-stoloniferous rhizome, long ligule with rounded apex, pale yellow flowers, smaller labellum, longer peduncle, and green fruits. – Type: India, Kerala, Thiruvananthapuram Dist., Agastyamalay, 8 km from Athirumala towards Bonnacaud, 2 iii 2008, *V.P. Thomas & A.V. Prasanth* 103042 (holo CALI; iso CAL, MH).

*Rhizome* non-stoloniferous, stout, robust, c.1.5 cm thick, length/breadth ratio c.3, creamy-white inside, covered with scales; scales chartaceous, glabrous, margin ciliate. *Leafy shoots* 100–200 cm tall, robust, clump forming; sheath c.2 cm wide at base, green, margin ciliate, apex rounded, pubescent externally, glabrous internally. *Leaves* 20–30 per shoot; lamina lanceolate, 22–37 × 4–6.5 cm, sessile, dark green above, pale beneath, base cuneate, margin glabrous, apex acuminate and pubescent, glabrous on both surfaces; midrib green, glabrous; veins flat above. *Ligule* entire, lanceolate, 2.8–3.8 cm long, membranous, usually not caducous, pale green, margin ciliate, apex rounded, puberulous to glabrous externally. *Inflorescence* c.7.5 cm long, many-flowered, arising from the rhizome underground; peduncle c.2 cm long. *Bract* obovate, 1.7–2.3 × 1.2–1.8 cm, chartaceous, maroon, margin ciliate, apex rounded, puberulous externally, glabrous internally. *Bracteole* tubular, 1.5–1.7 × 0.45–0.5 cm, 2- or 3-lobed, membranous, white, unilaterally split, puberulous externally, glabrous internally. *Flower* 5–5.5 cm long, pale yellow. *Calyx* 1.4–2 × c.0.5 cm, 2- or 3-lobed, membranous, white, unilaterally split for c.0.5 cm, puberulous externally, glabrous internally; each lobe with a minute subapical cusp, apex slightly emarginate and ciliate. *Corolla* tube 2.3–2.4 cm long, pale yellow, c.0.35 cm wide at mouth, pubescent



FIG. 3. A–G: *Amomum agastyamalayanum*. A, habit; B, ligule; C, rhizome; D & E, flowers; F, inflorescence; G, infructescence. H–L: *Amomum newmanii*. H, ligule; I, rhizome; J, inflorescence; K, flower; L, infructescence.

externally, villous towards mouth within and glabrous towards base; dorsal corolla lobe ovate,  $1.9-2 \times c.1.1$  cm, pale yellow with pink-tinged apex, margin ciliate, apex hooded and ecuspidate, glabrous on both surfaces; lateral corolla lobes oblong,  $1.9-2 \times 0.5-0.55$  cm, pale yellow, margin ciliate towards apex, apex slightly folded, glabrous on both surfaces. *Labellum* obovate, 3-lobed with cleft midlobe,  $2.5-2.9 \times 2-2.4$  cm, pale yellow towards periphery, deep yellow in middle with red streaks at centre, margin wavy and crumpled, pubescent near throat inside. *Lateral staminodes* subulate, c.0.3 cm long, base reddish and pubescent. *Stamen* 1.8–1.9 cm long; filament  $0.9-1.1 \times 0.25-0.3$  cm, pale yellow, pubescent externally, glabrous within; connective pubescent; crest  $c.0.3 \times 1.3$  cm, truncate, slightly lobed, pale yellow, glabrous; anther thecae oblong, 0.6–0.65 cm long, creamy-white, base rounded, apex nearly diverging, pubescent; dehiscing throughout their length. *Epigynous glands* 2, oblong, c.0.4 cm long, creamy-white, apex nearly truncate, glabrous. *Ovary* obconic,  $c.0.5 \times 0.2-0.3$  cm, pubescent externally; locules 3; ovules many on axile placentae; style c.4 cm long, pubescent; stigma cup-shaped, c.0.1 cm across, yellow-white, mouth ciliate, opening terminal. *Infructescence* 15–17 cm long, 8–12 capsules per spike; peduncle 11–14 cm long. *Capsule* globose, densely echinate,  $2.2-2.5 \times 2.2-2.5$  cm, green, calyx not persistent. *Seeds* many, angular, 0.2–0.3 cm, brown, aromatic, arillate; aril white.

*Distribution.* Known only from the type locality, Agastyamalay. Only two patches from a single locality were located.

*Ecology.* Growing as undergrowth in evergreen forest above 1000 m. Flowering and fruiting: February–July.

*Etymology.* Named in honour of Dr M. F. Newman of the Royal Botanic Garden Edinburgh for his contributions to systematic studies on Zingiberaceae.

*Proposed IUCN conservation status.* Critically Endangered CR B1ab(i,ii,iii)+B2ab (i,ii,iii) (IUCN, 2001). This species is known only in Agastyamalay. A continuing decline is projected in the extent of occurrence, the area of occupancy and the quality of habitat due to continuous human interference. The area receives a great deal of foot traffic, especially during the pilgrimage season, which may damage the existing population. Survival of this species in *ex situ* collections is low.

*Additional specimen examined.* INDIA. **Kerala:** Thiruvananthapuram Dist., Agastyamalay, 8 km from Athirumala towards Bonnacaud, 5 vii 2009, V.P. Thomas & K.M. Prabhu Kumar 115584 (CALI).

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