Key to the Malesian species of Mallotus (Euphorbiaceae)

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Key words
Euphorbiaceae
identification key
Mallotus

Abstract
An identification key to all Malesian species of Mallotus was still lacking. So far, only keys per section of Mallotus or keys per island were generated. This is the first attempt to create a key for all species of Mallotus in Malesia.

INTRODUCTION

The revision of the Malesian species of Mallotus Lour. was recently finished (Van Welzen et al. 2009), the results are available via www.nationaalherbarium.nl/euphors. The revision was a compilation of various revisions of sections or parts of sections; Part of former sect. Hancea (Seem.) Pax & K.Hoffm., (Slik & Van Welzen 2001, Van Welzen et al. 2006), sect. Mallotus (Sierra & Van Welzen 2005), sect. Philippinensis Pax & K.Hoffm. (Sierra et al. 2005), sect. Polyadenii Pax & K.Hoffm. (Bollendorff et al. 2000), sect. Rottleriopsis Müll. Arg. (incl. sect. Axenfeldia Pax & K.Hoffm., Van Welzen & Sierra 2006, Kulju et al. 2007, Sierra et al. 2007a) and sect. Stylanthus (Rchb.f. & Zoll.) Pax & K.Hoffm. (Slik & Van Welzen 2001). From a geographical point of view, Malesia includes the three southernmost provinces of Thailand, Malaysia, Singapore, Indonesia, the Philippines, Brunei, East Timor and Papua New Guinea (Raes & Van Welzen 2009). However, as there is a separate website dedicated to the Euphorbiaceae of Thailand (www.nationaalherbarium.nl/thaieuh); see also Chayamarit & Van Welzen 2005, Van Welzen & Chayamarit 2007) occurrences in the Thai part of Malesia are not accounted for here.

Identification keys were presented per section (see former references) or they were presented in flora compilations for areas within Malesia: Borneo (Airy Shaw 1975, Slik et al. 2000, Slik & Van Welzen 2004), Java (Backer & Bakhuizen van den Brink Jr 1963), Malay Peninsula (Whitmore 1973), New Guinea (Airy Shaw 1980) and Sumatra (Airy Shaw 1981).

The revisions resulted in several name changes, the description of new species and different circumscriptions of species and genera. Mallotus sect. Oliganthae Airy Shaw and most of sect. Hancea (Seem.) Pax & K.Hoffm. now form genus Hancea Seem. together with Cordemoya Baill. (Sierra et al. 2007b), while the genera Neotrewia Pax & K.Hoffm., Octospernum Airy Shaw and Trewia L. are united with Mallotus (Kulju et al. 2007). Consequently, the keys in all regional island revisions have become outdated. The delimitation of the sections is also still a problem, sections like Trewia and results can be e-mailed to the first author.

KEY

Distributions mentioned only refer to the distribution within Malesia; the species may also occur outside Malesia. Behind every species is a reference to a description (which can also be found via www.nationaalherbarium.nl/euphors). The numbers before the species refer to the numbers on the website.

1. All leaves (sub)opposite, sometimes one of each pair much smaller and even stipuliform (when caducous then inflorescence opposite to large leaf) ........................................ 2
2. Each leaf of a pair with a similar shape, although one some smaller, sometimes stipuliform ........................................ 3
3. Reduced leaf of each pair: blade cordate to obovate, more than 1 cm broad ........................................ 4
4. Leaf base symmetric to slightly oblique, emarginate. Lower leaf blade surface with few (venation triplinerved) to many glandular hairs (pinnate or trilinerved), often also stellate hairs. Apical extrafloral nectaries on upper leaf blade surface absent or on the nerves (secondary veins) ................. 5
5. Leaf base oblique, asymmetric on one side half heart-shaped, the other almost cuneate. Lower leaf blade surface without or with very few glandular hairs, very seldomly a few stellate hairs, venation pinnate. Apical extrafloral nectaries on upper leaf blade surface in between nerves. ................. 32. M. miquelianus (Scheff.) Boerl. (Slik & Van Welzen 2001: 55)

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5. Venation triplinerved. Stipules 4–11 mm long ........ 6
5. Venation pinnate. Stipules 1.2–4.5 mm long .......... 7
6. Upper surface of leaf blade with apical extrafloral nectaries next to basal ones; apical extrafloral nectaries on upper leaf blade surface on the nerves (secondary veins). Staminode inflorescences up to 23 cm long; staminate bracts 3–7 mm long, pistillate bracts 4–10 mm long ........ 20. *M. havilandii* Airy Shaw (Slik & Van Welzen 2001: 52)
6. Upper surface of leaf blade without apical extrafloral nectaries, only nectaries in basal half present. Staminode inflorescences up to 10 cm long; staminate bracts 1.2–1.4 mm long, pistillate bracts 1.5–1.7 mm long ........ 31. *M. minimifructus* S.E.C. Sierra (Sierra et al. 2007a: 79)
7. Stipules 1.2–1.5 mm long. Lower blade surface with simple hairs only. — Malay Peninsula ............. 11. *M. concinclus* Airy Shaw (Van Welzen et al. 2006: 371)
7. Stipules 1.5–4.5 mm long. Lower blade surface with many stellate hairs. — Moluccas (Sulu Archipelago), Lesser Sunda Islands (Bali, Lombok) ........... 21. *M. insularum* (Airy Shaw) Slik (Slik & Van Welzen 2001: 54)
8. Upper leaf blade surface with discoid glandular hairs .. 9
8. Upper leaf blade surface without discoid glandular hairs ...................................................... 16
9. Stipules early caducous to late caducous, small, 0.6–2.5 by 0.4–1 mm ......... 10
9. Stipules late caducous, large, 18–30 by 8–10 mm ....... 8. *M. cauliflorus* Ment. (Sierra et al. 2007a: 52)
10. Basal pair of nerves ending in the margin above or below middle of blade. — W Malesia, W New Guinea, Solomon Islands ....................... 11
11. Fruit locules ridged or not, without wings. Leaf margin generally entire. Entire plant either pubescent or glabrous 12
12. Leaf blades (somewhat) hairy above ........................ 13
12. Leaf blades glabrous above ............................ 15
13. Domatia (usually) present. Stipules present, scar present when early caducous .................................. 14
14. Upper surface of leaf blade with only basally 0–13 randomly distributed extrafloral nectaries. Staminate inflorescences 3–8.5 cm long; flowers with c. 50 stamens. Pistillate inflorescences 8–31.5 cm long — Solomon Islands .................. 43. *M. puber* Bollend. (Bollendorff et al. 2000: 334)
16. Venation of leaf blade pinnate ........................................... 17
16. Venation of leaf blade (weakly) triplinerved .......... 22
17. Stipules 9–13 mm long. Leaf blades: narrowly obovate, glandular hairs absent. — Malay Peninsula ........ 18
17. Stipules 1.8–6 mm long. Leaf blades: ovate to obovate, glandular hairs absent or present — Malay Peninsula to New Guinea ............... 19
18. Stipules 2.5–3.5 mm wide, persistent. Petioles 14–61 mm long. Leaf blades: base shallowly emarginate, nerves 9 or 10 per side ........ 1. *M. actinoneurus* Airy Shaw (Sierra et al. 2007a: 46)
19. Lower leaf blade surface without or with a few discoid glandular hairs ........................................... 20
19. Lower leaf blade surface with many discoid glandular hairs ................................................................ 21
20. Stipules 2–4 by 0.2–0.3 mm. Leaves: petiole 2–8 mm long; blade narrowly elliptic, 8.2–16 by 1.4–4.7 cm. Stamens 25–30 per flower — New Guinea ............... 2. *M. attenuatus* Airy Shaw (Sierra et al. 2007a: 47)
20. Stipules 1.8–6 by 0.7–2 mm. Leaves: petiole 4–11 mm long; blade ovate to obovate, 4.8–35.5 by 1.5–19.5 cm. Stamens 30–60 per flower — Borneo, Philippines, Sulawesi ........... 13. *M. cunningii* Müll.Arg. (Kuju et al. 2007: 121)
21. Petioles 2.5–20(–35) mm long. Leaf blades: base obtuse, cuneate to shallowly attenuate. Staminate inflorescences: nodes per branch 7–39; flowers: sepals 1.5–2.3 mm long. Pistillate flowers 1.5–2 mm diam, pedicels 0.5–1 mm long. — Java, Borneo and Philippines to New Guinea ................. 45. *M. resinuosus* (Blanco) Merr. (Sierra et al. 2007a: 88)
22. Petioles apically (strongly) pulvinate. Domatia always present .................................................. 23
22. Petioles apically not pulvinate. Domatia sometimes present ....................................................... 26
23. Stigmas narrow (0.2–0.7 mm wide) or broad, c. 1 mm wide, not hairy beneath by eye. Spines on ovary individual, not in groups, upper part glabrous or loosely hairy. Bracts 0.7–8 mm long. Pistillate inflorescences up to 14 cm long; staminate ones up to 11 or up to 25 cm long. Upper leaf base without extrafloral nectaries along the midrib or sometimes a single one .................... 24
23. Stigmas broad, 0.6–1 mm wide, densely yellowish stellately hairy beneath. Spines on ovary in groups, completely, densely tomentosely hairy. Bracts (2.3–)3.3–10 mm long. Pistillate inflorescences up to 26 cm long; staminate ones up to 19 cm. Upper leaf base often with several pairs of extrafloral
nectories along midrib. 7. *M. caudatus* Merr. (Van Welzen & Sierra 2006: 376)

24. Midrib sparsely hairy to hairy on lower surface. Stellately bundled hairs stiff, pointing all directions (3-dimensional), giving no silvery reflection. 25

24. Midrib glabrous on lower surface. Stellately bundled hairs soft, in a horizontal plane (2-dimensional), usually providing a silver sheen abaxially. 54. *M. waryi* King ex Hook.f. (Van Welzen & Sierra 2006: 384)


26. Plants from New Guinea. 27

26. Plants not from New Guinea, but from Malay Peninsula up to the Philippines and Moluccas. 33

27. Discoid glandular hairs absent. 28

27. Discoid glandular hairs present. 30

28. Stipules 3–7 mm long. Leaf blades length/width ratio 1.6–2.6, domatia present. Stamine inflorescences with 5–8 nodes per branch. Pistillate inflorescences racemes or umbel-like. 29

28. Stipules 1–1.8 mm long. Leaf blades length/width ratio 1.1–1.4, domatia absent. Stamine inflorescences with 35–47 nodes per branch. Pistillate inflorescences racemes. 16. *M. didymochryseus* Airy Shaw (Sierra et al. 2007a: 61)


29. Leaf blades: lower surface with few hairs, apex acute, acuminate to culate. Stamine inflorescences 4.5–6 cm long; flowers: pedicels 3–4.5 mm long, filaments glabrous. Pistillate inflorescences 12–17 cm long. 30. *M. macularis* Airy Shaw (Sierra et al. 2007a: 78)

30. Extrafloral nectaries marginal, domatia sometimes present. Fruits smooth or spiny, spines 15–80. 31

30. Extrafloral nectaries along the midrib, also all over the blade, domatia absent. Fruits spiny, spines 500–600. 32

31. Petioles 1–2.5 mm wide. Leaf blades: lower surface densely to sparsely hairy, domatia absent. Stamens 45–120. Fruits smooth or spiny. 32


32. Leaf blades broadly ovate to ovate, length/width ratio 1–1.3. Stipules absent. Staminate flowers 2.8–5.5 mm diam; filaments 0.5–2.3 mm long. Fruits 5–15 mm long, surface spiny. 52. *M. tiliolius* (Blume) Müll.Arg. (Sierra et al. 2007a: 96)

32. Leaf blades ovate to elliptic, length/width ratio 1.4–1.8. Stipules present. Staminate flowers 5–6 mm diam; filaments 2.5–5 mm long. Fruits 17–22.5 mm long, surface smooth. 53. *M. trinervius* (K.Schum. & Lauterb.) Pax & K.Hoffm. (Sierra et al. 2007a: 99)

33. Indumentum only with stellately-tufted hairs. Fruits indehiscent, 10–19 by 4–19 mm, surface smooth or with slightly verrucose to spiny-like projections; wall c. 0.1 mm thick. 34

33. Indumentum with simple, tufted and/or stellately-tufted hairs. Fruits dehisc and/or indehiscent, if indehiscent then 16–29 by 21–35 mm, surface rugose, wall 2–8 mm thick. 35

34. Indumentum of appressed, brown-yellow hairs. Pistillate flowers 3–4 mm diam, pedicels 1.3–2 mm long. Fruits ellipsoid, 10–12 by 4–4.4 mm, without ridges when dry; surface smooth, sparsely hairy. — Sumatra, Java, Airy Shaw. 4. *M. blumeanus* Müll.Arg. (Sierra et al. 2007a: 48)

34. Indumentum of erect, yellow hairs. Pistillate flowers 0.8–1.2 mm diam, pedicels 0.8–1.2 mm long. Fruits spheroid, 15–19 by 15–19 mm, with 3 longitudinal ridges when dry, surface slightly verrucose, densely hairy. — Sumatra. 47. *M. sphaerocarpus* (Miq.) Müll.Arg. (Sierra et al. 2007a: 93)

35. Leaf blades: lower surface sparsely to densely hairy, broadly ovate to obovate, domatia sometimes present. Stipules present. 36

35. Leaf blades: lower surface densely hairy, broadly ovate to obovate, domatia absent. Stipules absent. 52. *M. tiliolius* (Blume) Müll.Arg. (Sierra et al. 2007a: 96)

36. Leaf blades: ovate to obovate, nerves 3–10 per side. Stipules triangular to linear-triangular, 0.6–12 by 0.5–5 mm. Fruits spiny or smooth. 37

36. Leaf blades: elliptic, nerves 2 or 3 per side. Stipules deltoid, 0.4–0.5 by 0.4–0.5 mm. Fruits smooth. — Borneo. 28. *M. longinervis* M.Aparicio (Sierra et al. 2007a: 76)

37. Stipules 1.5–12 mm long. Fruits spiny capsules or rugose drupes. 38

37. Stipules 0.6–1.3 mm long. Fruits smooth capsules. 35. *M. montanus* (Wall. ex Müll.Arg.) Airy Shaw (Sierra et al. 2007a: 83)

38. Extrafloral nectaries marginal throughout blade, sometimes also all over the blade. Fruits capsular, dehiscing. 39

38. Extrafloral nectaries basal or marginal on lower half, never all over the blade (except sometimes *M. nudiflorus*, then fruits indehiscent drupes). 42

39. Leaf blades with 4–6(–9) nerves per side. Stipules absent. 30

39. Leaf blades with 7–9 nerves per side. Stipules 0.5–1 mm wide. 40

39. Leaf blades with 7–9 nerves per side. Stipules 1.5–5 mm wide. 41

40. Leaf blades drying green to green-brown. Stipules linear-triangular. Pistillate inflorescences with entire or trilobed bracts; pistillate flowers: buds ellipsoid, style 2–4 mm long, stigmas 0.8–1 mm wide. Staminate flowers with connate filaments. — Borneo, Philippines. 12. *M. connatus* M.Aparicio (Sierra et al. 2007a: 54)

40. Leaf blades drying brown. Stipules narrowly triangular. Pistillate inflorescences with trilobed bracts; pistillate flowers: buds ovoid, style 0.1–0.2 mm long, stigmas 1–1.3 mm wide. Staminate flowers with filaments free to slightly connate at the base. — Sumatra, Java, Borneo, Lesser Sunda Islands. 46. *M. rudulus* (Miq.) Müll.Arg. (Sierra et al. 2007a: 91)
41. Stipules densely hairy outside. Petioles 2–3 mm wide. Leaf blades length/width ratio 1.7–2.6. Staminate flowers 4.8–5.2 mm diam, filaments connate in lower half, hairy. Pistillate inflorescences 16–34 cm long; flowers: pedicels 6–11 mm long. Fruits 17–20 mm long. — Malay Peninsula, NW Borneo. 18. M. eximius Airy Shaw (Sierra et al. 2007a: 64)

41. Stipules scatteredly hairy to glabrous outside. Petioles 1.3–1.8 mm wide. Leaf blades length/width ratio 1.5–1.9. Staminate flowers 3–4.2 mm diam, filaments free, glabrous. Pistillate inflorescences 9.4–16 cm long; flowers: pedicels 1–2 mm long. Fruits 7–7.5 mm long. — Myanmar, Thailand, Malaya Peninsula, Sumatra, Java, Borneo (Sabah), Philippines, Sulawesi. 26. M. leucocalyx Müll.Arg. (Sierra et al. 2007a: 75)

42. Extrafloral nectaries 1 or 2 per side, at least one pair always present on the first pair of nerves. 43

42. Extrafloral nectaries 1–7 (–17) per side, always below the nerves. 44

43. Stipules 2–4 mm long, Leaf blades ovate to obovate. Inflorescences with triangular bracts. Staminate flowers: pedicels 1.8–2.2 mm long, stamens 22–32. Pistillate flowers: stigmas 0.7–1 mm long. Fruits 3–4 mm long. — Malay Peninsula. 15. M. decipiens Müll.Arg. (Sierra et al. 2007a: 62)


44. Leaf blades: first pair of nerves ending in the lower half of the largest leaves, nerves 3–10 per side. Stipules 1.6–10 mm long. 45

44. Leaf blades: first pair of nerves ending in the upper half, nerves 3–5 per side. Stipules 1.5–3 mm long. 22. M. korthalsii Müll.Arg. (Sierra et al. 2007a: 72)

45. Fruits drupes, 18–29 by 21–35 mm. Leaf blade margin often dentate, apex acuminate to aristate, lower surface without conspicuous large hair tufts at petiole insertion (hair tufts can be present, but are similar to those in axils of veins higher up the midrib), hairy domatia usually present in axils of most veins along the midrib, not glaucous, not to densely gland-dotted, venation ending parallel to the margin. 19. M. floribundus (Blume) Müll.Arg. (Siilk & Van Welzen 2001: 41)

48. Leaf blade ovate to obovate, length/width ratio (1.3–)2–4, margin often dentate, apex acuminate to aristate, lower surface with conspicuous large hair tufts at petiole insertion (hair tufts can be present, but are similar to those in axils of veins higher up the midrib), hairy domatia usually present in axils of most veins along the midrib, not glaucous, not to densely gland-dotted, venation ending parallel to the margin. 39. M. feltatus (Geiseler) Müll.Arg. (Siilk & Van Welzen 2001: 41)

49. Fruits drupes. Stipules absent. Connective distinctly broadened, umbrella-like, with thecae underneath. Leaves subpeltate, c. 3 mm. — New Guinea. 50

49. Fruits capsules. Stipules present, often early caducous. Connective of stamens slender to somewhat broadened, not umbrella-like with thecae underneath. Leaves subpeltate to peltate, 3–80 mm. — Malesia. 51

50. Leaf blade coriaceous with 0–6 marginal extrafloral nectaries per side (next to 2 or 4 basal ones). Pistillate sepals 1.5–2 mm long. Ovary (3 or) 4 (or 5)-locular. Fruits 5–8 by 8–10 mm. 9. M. chromocarpus Airy Shaw (Sierra et al. 2005: 238)

50. Leaf blade papery with 9–20 marginal extrafloral nectaries per side (next to 2 (– 4) basal ones). Pistillate sepals 2.7–4.5 mm long. Ovary (7 or) 8 or 9-locular. Fruit 9–12 by 18–22 mm. 41. M. pleiogynus Pax & K.Hoffm. (Kulju et al. 2007: 128)

51. Plants not smelling of fenugreek. Staminate inflorescences paniculate. Pistillate inflorescences racemes, panicles or spikes; pistillate calyx basically to almost apically connate, lobes regular, persistent. 52

51. Plants smelling of fenugreek. Staminate inflorescences thyridose racemes. Pistillate inflorescences racemes; pistillate calyx caducous to persistent, completely enclosing ovary with only stigmas exerted, torn open into irregular lobes when fruit develops. 54

52. Domatia, if present, without a dense tuft of woolly hairs. Leaf blade not thickened near petiole insertion, rarely curved upwards. Pistillate inflorescences in racemes and/or panicles. 53


53. Stipules linear triangular, 10–17 by 0.8–1.2 mm. Indumentum always very soft-floccose, floculi up to 6 mm long, never tomentose. Leaves up to 80 mm peltate, blade 10.5–58 by 9–45 cm, domatia absent. Pistillate flowers sometimes with staminodes, ovary without individually visible spines. Fruit spines straight, hairs forming a continuous layer. 3. M. barbatus Wall. ex Müll.Arg. (Sierra & Van Welzen 2005: 251)

53. Stipules narrowly triangular, 0.7–1.5 by 0.1–0.3 mm. Indumentum sometimes soft-floccose, floculi up to 4 mm long, rarely tomentose. Leaves up to 40 mm peltate, blade 10–29 by 8–25 cm, domatia absent or present. Pistillate flowers never with staminodes, ovary with individually visible spines. Fruit spines curved, hairs not forming a continuous layer. 33. M. mollissimus (Geiseler) Airy Shaw (Sierra & Van Welzen 2005: 257)

54. Stipules caducous to persistent, up to 9 mm long. Upper leaf surface conspicuously yellow-red gland-dotted (to not or sparsely gland-dotted, but then stipules 5–9 mm
41. Stipules early caducous, up to 5 mm long. Upper leaf surface without or with only a few yellow-red glands, lower surface gland-dotted or not .................................................. 39. *M. peltatus* (Geiseler) Müll.Arg. (Slik & Van Welzen 2001: 41)

55. Stipules usually semi-persistent, 5–9 mm long, sometimes placed c. 3 mm above petiole insertion. Leaves usually very large, ovate (to obovate), 5–33.5 by 3–21 cm, peltate part 7–38 mm, lower surface usually sparsely gland-dotted (usually 0–16 glands per cm²). Staminate inflorescences up to 32 cm long, up to 64 nodes with flowers; bracts caducous to persistent, narrowly triangular to triangular, 1.5–6.5 mm long; buds ovoid. Pistillate inflorescences up to 37 cm long, up to 54 nodes with flowers; bracts caducous to persistent, narrowly triangular, 3.5–7 mm long. Fruits echinate — Borneo and the Philippines .................................................. 23. *M. lackeyi* Elmer (Slik & Van Welzen 2001: 38)

55. Stipules caducous to (semi-)persistent, 2.5–5 mm long, placed at petiole insertion. Leaves usually small, ovate to broadly ovate to orbicular, 3–16 by 2–15 cm, peltate part 3–22 mm, lower surface usually very densely gland-dotted (often exceeding 100 glands per cm²). Staminate inflorescences up to 11 cm long, up to 38 nodes with flowers; bracts caducous, triangular to ovate to broadly ovate, 1.5–2.8 mm long; buds globose. Pistillate inflorescences up to 14.5 cm long, up to 18 nodes with flowers; bracts caducous, triangular to ovate to broadly ovate, 1.8–3.8 mm long. Fruits verrucose to echinate — Malay Peninsula ........................................... 51. *M. thorelii* Gagnep. (Slik & Van Welzen 2001: 47)

56. Upper leaf blade surface with discoid glandular hairs. .................................................. 57

56. Upper leaf blade surface without discoid glandular hairs ........................................... 63

57. Domatia (usually) present. Stipules present, scar present when early caducous .................................................. 58


58. Plants without smell of fenugreek. Fruits smooth, spineless, but sometimes wings or ridges. Pistillate calyx basally to halfway connate, regularly lobed. Stipules 0.8–2.5 mm long (early caducous) .................................................. 59


59. Basal pair of nerves ending in the margin above or below middle of blade. — W Malesia, W New Guinea, Solomon Islands .................................................. 60


60. Fruit locules ridged or not, without wings. Leaf margin generally entire. Entire plant either pubescent or glabrous 61

60. Fruit locules with long pointed wings. Leaf margin often slightly crenate. Usually only petioles pubescent, otherwise glabrous .................................................. 50. *M. sumatranus* (Miq.) Müll.Arg. (Bollendorff et al. 2000: 329)

61. Fruit locules without ridges, subglobose. Pistillate inflorescences with relatively long pedicels, 6–55 mm long. — W Malesia, New Guinea, Solomon Islands .................................................. 62


62. Upper surface of leaves basally impressed glands on first pair of nerves (or veins). Fruits 8–15 by 10–25 mm diam. Entire plant usually glabrous. Leaf base acute to obtuse and sometimes slightly emarginate; petiole often more or less pulvinate at both ends. — W Malesia, New Guinea .................................................. 27. *M. leucodermis* Hook.f. (Bollendorff et al. 2000: 326)

62. Upper surface of leaves basally with numerous small glands randomly distributed around petiole attachment. Fruits 5–8 by 7–10 mm diam. Entire plant usually pubescent (sometimes glabrous). Leaf base broadly rounded to cordate; petiole usually not pulvinate at both ends. — Solomon Islands .................................................. 43. *M. puber* Bollend. (Bollendorff et al. 2000: 334)

63. Shrubs to trees, no climbers. Ovaries (2 or ) 3–5-locular ........................................... 64

63. Climber. Ovary (1 or) 2- or 3-locular .................................................. 44. *M. repandus* (Rottler) Müll.Arg. (Sierra et al. 2005: 234)

64. Leaf blade of largest leaves up to 2 times as long as broad ........................................... 65

64. Leaf blade of largest leaves more than 2 times as long as broad ........................................... 68

65. Stipules present, scar present when early caducous. Domatia (usually) present .................................................. 66


66. Margin of leaf blade unlobed; largest extrafloral nectaries up to 1.5 by 0.7 mm; lower surface sparsely hairy. Fruits armed with 65–80 spines or unarmed but with longitudinal ridges .................................................. 67

66. Margin of leaf blade sometimes with 2 lobes; basal extrafloral nectaries 1.8–5 by 1–2.5 mm; lower surface densely hairy; colouring brownish grey to coppery when dry. Fruits with few spines (< 20) .................................................. 38. *M. paniculatus* (Lam.) Müll.Arg. var. *paniculatus* (Sierra & Van Welzen 2005: 263)


67. Fruits indehiscent, with 3 longitudinal ridges, spines absent. Petioles 56–80(–130) mm long; leaf blade ovate to elliptic, sometimes slightly falcate, 12–32 by 10–18 cm. Connective umbrella-like. — Sumatra .................................................. 47. *M. sphaerocarpus* (Miq.) Müll.Arg. (Sierra et al. 2007a: 93)

68. Fruits and ovaries unarmed, without spines. Plants not smelling like fenugreek. Discoid glandular hairs absent, then leaves slightly hairy underneath, or often densely present, reddish, then leaves densely hairy underneath .................................................. 69

69. Discoid glands absent. Leaf blades sparsely hairy underneath, venation pinnate. — Malay Peninsula.......................... 1. M. actinoneurus Airy Shaw (Sierra et al. 2007a: 46)

69. Discoid glands often densely present, especially on fruits, reddish. Leaf blades densely hairy underneath, venation triplinerved. — Malesia ............................................. 40. M. philippensis (Lam.) Müll.Arg. (Sierra et al. 2005: 230)

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REFERENCES

Sierra SEC. Aparicio M, Gebraad MJH, Kulju KKM, Van Welzen PC. 2007a. The morphological range in Mallotus (Euphorbiaceae) and a taxonomic revision of its section Rottleriopsis (including Axenfeldia) in Malesia, Thailand and Africa. Blumea 52: 21–113.