

## หนาด, ใบ (NAT, BAI)

หนาดหลวง, ใบ (NAT LUANG, BAI), หนาดใหญ่, ใบ (NAT YAI, BAI)

Blumeae Balsamiferae Folium

Blumea Balsamifera Leaf

**Category** Carminative, muscle relaxant, antidermatitis.

**Blumea Balsamifera Leaf is the dried mature leaf of *Blumea balsamifera* (L.) DC [*Conyza balsamifera* L., *Placus balsamifer* (L.) Baill.] (Family Compositae), Herbarium Specimen Number: DMSC 5330, Crude Drug Number: DMSc 1263.**

**Constituents** Blumea Balsamifera Leaf contains flavonoids such as blumeatin and quercetin. It also contains a volatile oil consisting of *l*-borneol and camphor. Other compounds are tannins, phenolics, sterols, etc.

**Description of the plant** (Fig. 1) Shrub or subshrub, up to 4 m tall; stem erect, bark greyish brown, tomentose, branched. Leave simple, alternate or spirally arranged, lanceolate, oblong-lanceolate, elliptic, or ovate-elliptic, 5 to 30 cm long, 1.5 to 12 cm wide, apex acute to acuminate, base attenuate or obtuse, margin serrulate to serrate, usually with upcurved teeth, rarely dentate or lacerate, coriaceous, bright green, upper surface rugose, pubescent and glandular hairs, lower surface tomentose, rarely woolly; petiole 1 to 4 cm long, with 1 to 6 pairs of appendages, 0.6 to 1.5 cm long. Inflorescence spreading panicle, terminal and/or axillary, 7 to 30 cm long; peduncle 0.2 to 1 cm long; capitula 4 to 7 mm in diameter; involucre campanulate; phyllaries in 3 to 5 series, outer one lanceolate or oblong-lanceolate, 1 to 3 mm long, 0.4 to 0.5 mm wide, apex acute, pilose, inner one linear, 5 to 6 mm long, scarious with ciliate margin, pilose; receptacle 2.5 to 3 mm in diameter, slightly convex, alveolate, glabrous; marginal floret yellow, filiform, 4.5 to 6 mm long, 2- to 4-lobed, glabrous; disc floret yellow, 4 to 7 mm long, glabrous, lobe oblong-lanceolate, minute, pubescent with glandular hairs; anther 0.8 to 2 mm long, apical appendage round, base with branched tails; ovary inferior, style arm about 1 mm long, base swollen. Fruit an achene, brown, oblong, 1 to 2 mm long, about 0.3 mm wide, 5- to 10-ribbed, setuliferous; pappus reddish, bristly, 4 to 6 mm long, persistent. Seed 1.

**Description** Odour, borneol-like, aromatic; taste, slightly bitter.

**Macroscopical** (Fig. 1) Whole or broken leaves; whole leaf petiolate, brownish green to brownish, oblong-elliptic, elliptic to lanceolate, apex acute or acuminate, base attenuate or obtuse, margin serrulate to serrate, tomentose on both surfaces with prominent veins, brittle.

**Microscopical** (Figs. 2a–2d) Transverse section of the leaf through the midrib shows upper epidermis, mesophyll, vascular tissue, and lower epidermis. Upper epidermis: thick cuticle layer, a layer of rectangular cells, multicellular uniseriate trichomes, some with collapsed cells, glandular trichomes, and stomata. Mesophyll: a layer of rectangular palisade cells and loosen round spongy cells, and some containing starch grains; several layers of lamella and a few angular collenchyma cells in midrib. Vascular tissue: phloem and xylem. Lower epidermis: thin cuticle layer, a layer of rectangular cells, multicellular uniseriate trichomes, some with collapsed cells, glandular trichomes, and stomata.

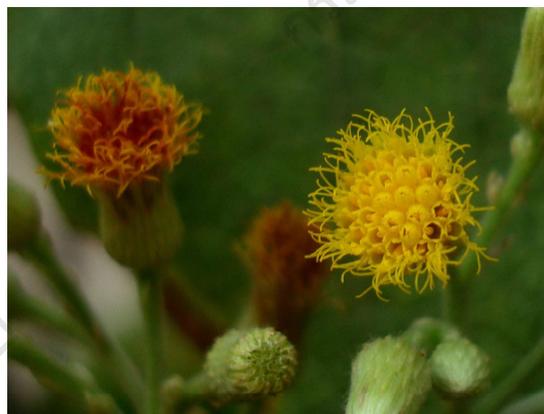
In surface view, the lamina shows wavy-walled epidermal cells, multicellular uniseriate trichomes, some with collapsed cells, glandular trichomes, and paracytic and anomocytic stomata.



1



2



3



4

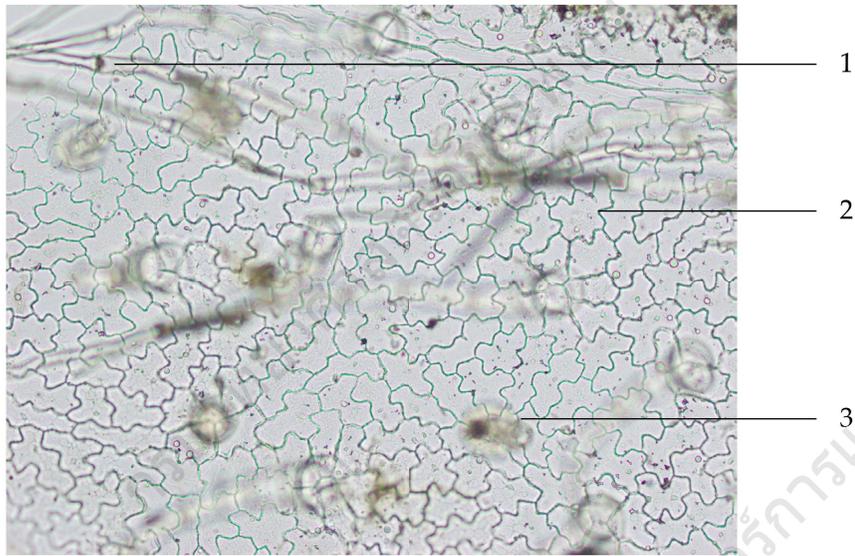


1 cm

5

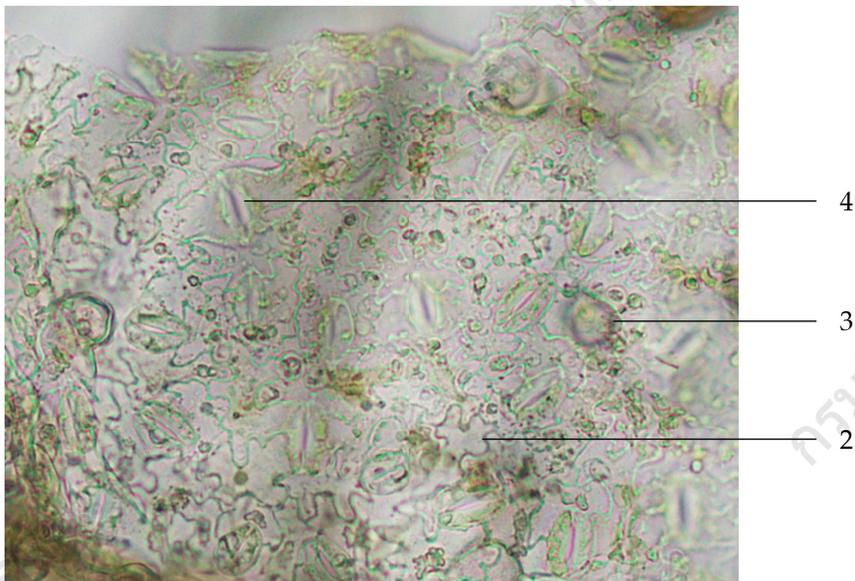
**Fig. 1** *Blumea balsamifera* (L.) DC

1. habit 2. flowering branches 3. inflorescences 4. infructescences 5. crude drug



100 μm

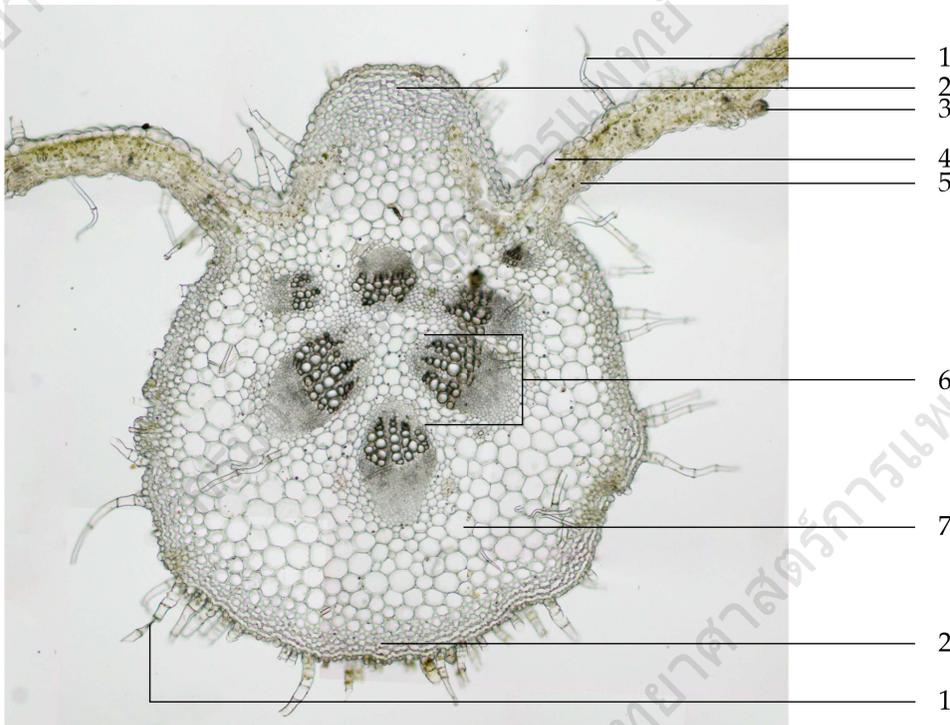
Upper Epidermis of the Lamina



100 μm

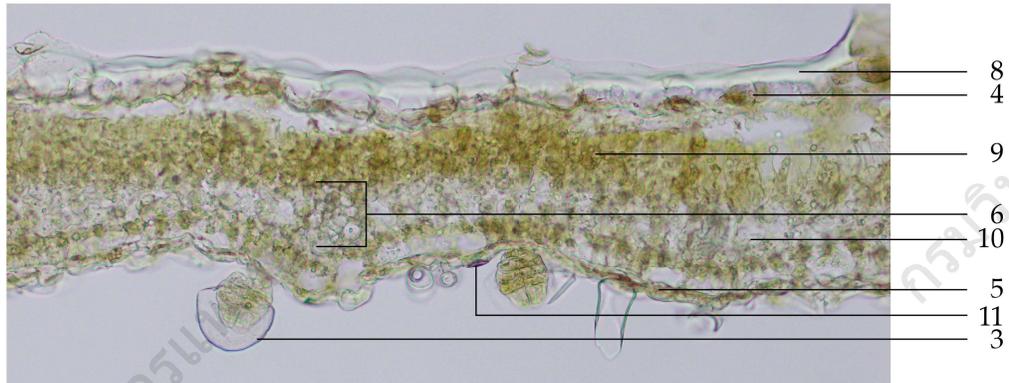
Lower Epidermis of the Lamina

**Fig. 2a** Photomicrographs of Epidermises of the Leaf of *Blumea balsamifera* (L.) DC  
 1. multicellular uniseriate trichome with collapsed cells  
 2. wavy-walled epidermal cell  
 3. glandular trichome  
 4. stoma



200 μm

Transverse Section of the Midrib

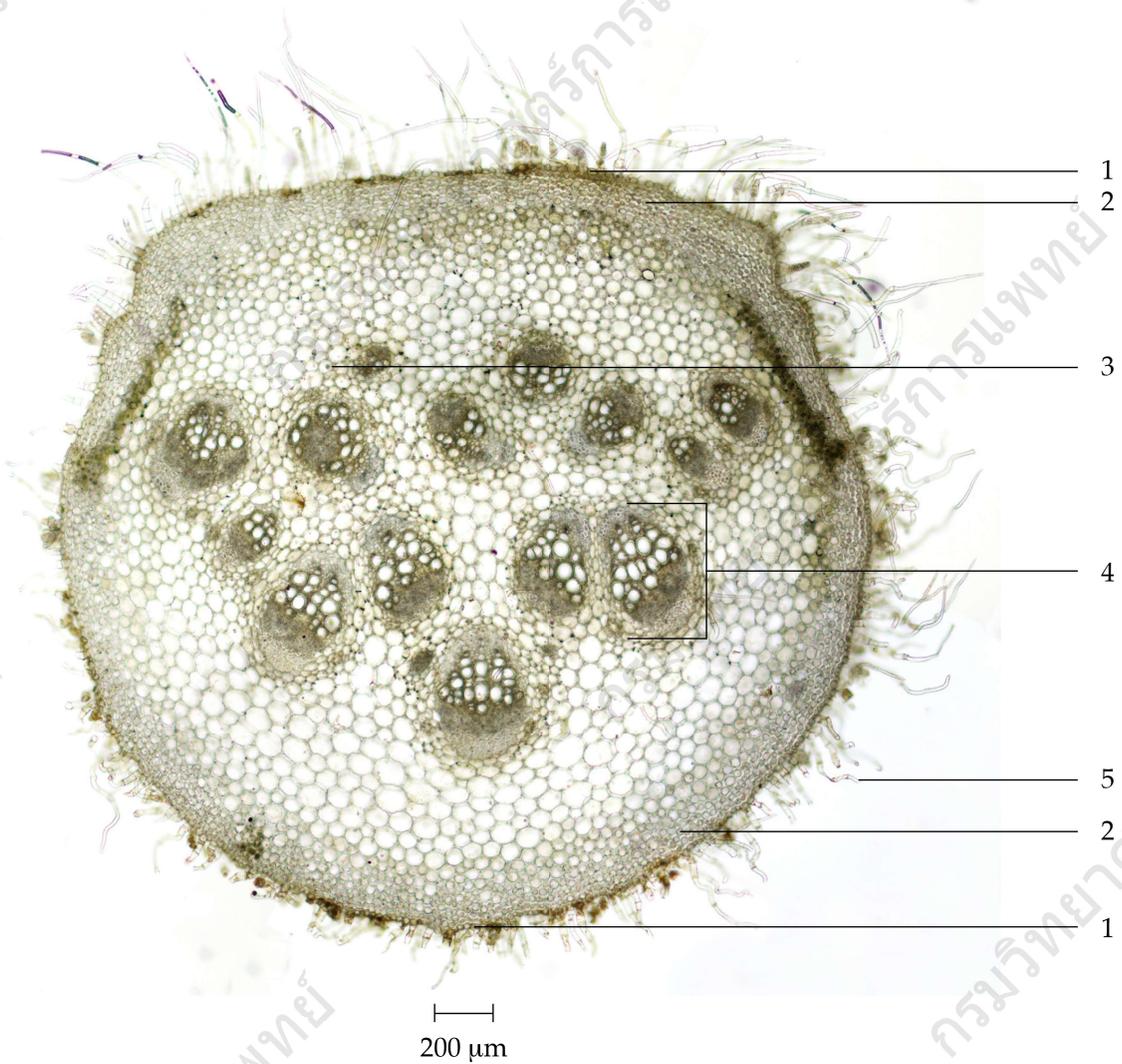


100 μm

Transverse Section of the Lamina

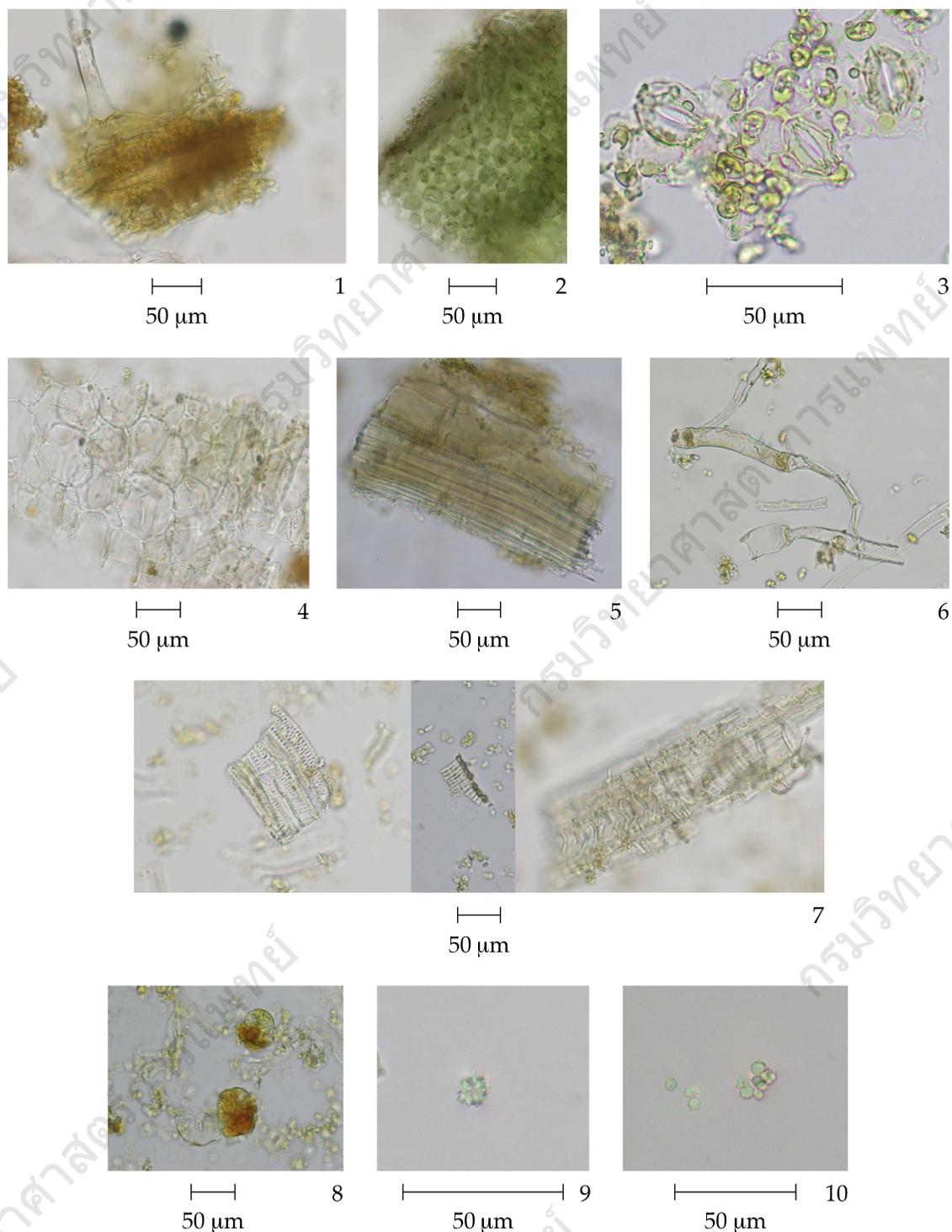
Fig. 2b Photomicrographs of Transverse Sections of the Leaf of *Blumea balsamifera* (L.) DC

- 1. multicellular uniseriate trichome with collapsed cells
- 2. collenchyma
- 3. glandular trichome
- 4. upper epidermis
- 5. lower epidermis
- 6. vascular tissue
- 7. parenchyma
- 8. cuticle
- 9. palisade cell
- 10. spongy cell
- 11. stoma



**Fig. 2c** Photomicrograph of Transverse Section of the Petiole of *Blumea balsamifera* (L.) DC

1. epidermis	4. vascular tissue
2. collenchyma	5. multicellular uniseriate trichome with collapsed cells
3. parenchyma containing rosette aggregate crystal	



**Fig. 2d** Photomicrographs of Powdered Drugs of the Leaves of *Blumea balsamifera* (L.) DC

1. lamina showing epidermal cells and trichome, in sectional view	6. fragment of trichome with collapsed cells
2. collenchyma	7. bordered-pitted, reticulate, spiral, and annular vessels
3. lower epidermis showing stomata	8. glandular trichomes
4. parenchyma, some containing rosette aggregate crystals	9. rosette aggregate crystal
5. fibres and parenchyma	10. starch grains

Transverse section of the petiole shows epidermis, cortex, and vascular tissue. Epidermis: a layer of epidermal cells some with rosette aggregate crystals, numerous multicellular uniseriate trichomes, some with collapsed cells, glandular trichomes, and stomata. Cortex: collenchyma, several layers of lamella cells underneath epidermal layer, parenchyma some with rosette aggregate crystals or starch grains, angular collenchyma near vascular tissue, and schizogenous cavities. Vascular tissue: phloem and xylem.

*Blumea Balsamifera* Leaf in powder possesses the diagnostic microscopical characters of the unground drug. Multicellular uniseriate trichomes, some with collapsed cells, and glandular trichomes are characteristic.

**Packaging and storage** *Blumea Balsamifera* Leaf shall be kept in well-closed containers, preferably of metal or glass, protected from light, and stored in a dry place.

#### Identification

A. To 200 mg of the sample, in powder, add 10 mL of *ethanol*, shake, allow to stand for 10 minutes, and filter. To 2 mL of the filtrate, add 0.5 mL each of a 5 per cent w/v solution of *aluminium chloride*, a 5 per cent w/v solution of *sodium nitrite*, and a 20 per cent w/v solution of *sodium hydroxide* successively. Mix well: a red colour develops.

B. Carry out the test as described in the “Thin-Layer Chromatography” (Appendix 3.1), using a high-performance plate with *silica gel GF254* as the coating substance and a mixture of 94 volumes of *chloroform*, 5 volumes of *methanol*, and 1 volume of *formic acid* as the mobile phase and allowing the solvent front to ascend 8 cm above the line of application. Apply separately to the plate as bands of 8 mm, 10  $\mu$ L of solution (A) and 2  $\mu$ L of solution (B). Prepare solution (A) by adding 5 mL of *methanol* to 200 mg of the sample, in *fine powder*, shaking, allowing to stand for 10 minutes, and filtering. For solution (B), dissolve 1 mg of *blumeatin* in 1 mL of *methanol*. After removal of the plate, allow it to dry in air and examine the plate under ultraviolet light (254 nm), marking the quenching bands. The chromatogram obtained from solution (A) shows a quenching band ( $hR_f$  value 39 to 41) corresponding to the *blumeatin* band obtained from solution (B); several other quenching bands are observed. Subsequently, spray the plate with a 1 per cent w/v solution of *aluminium chloride* in *ethanol* and examine under ultraviolet light (366 nm). The band due to *blumeatin* shows green fluorescent. One yellow, three green, and three red fluorescent bands are also observed (Fig. 3).

**Water** Not more than 9.0 per cent v/w (Azeotropic Distillation Method, Appendix 4.12).

**Foreign matter** Not more than 2.0 per cent w/w (Appendix 7.2).

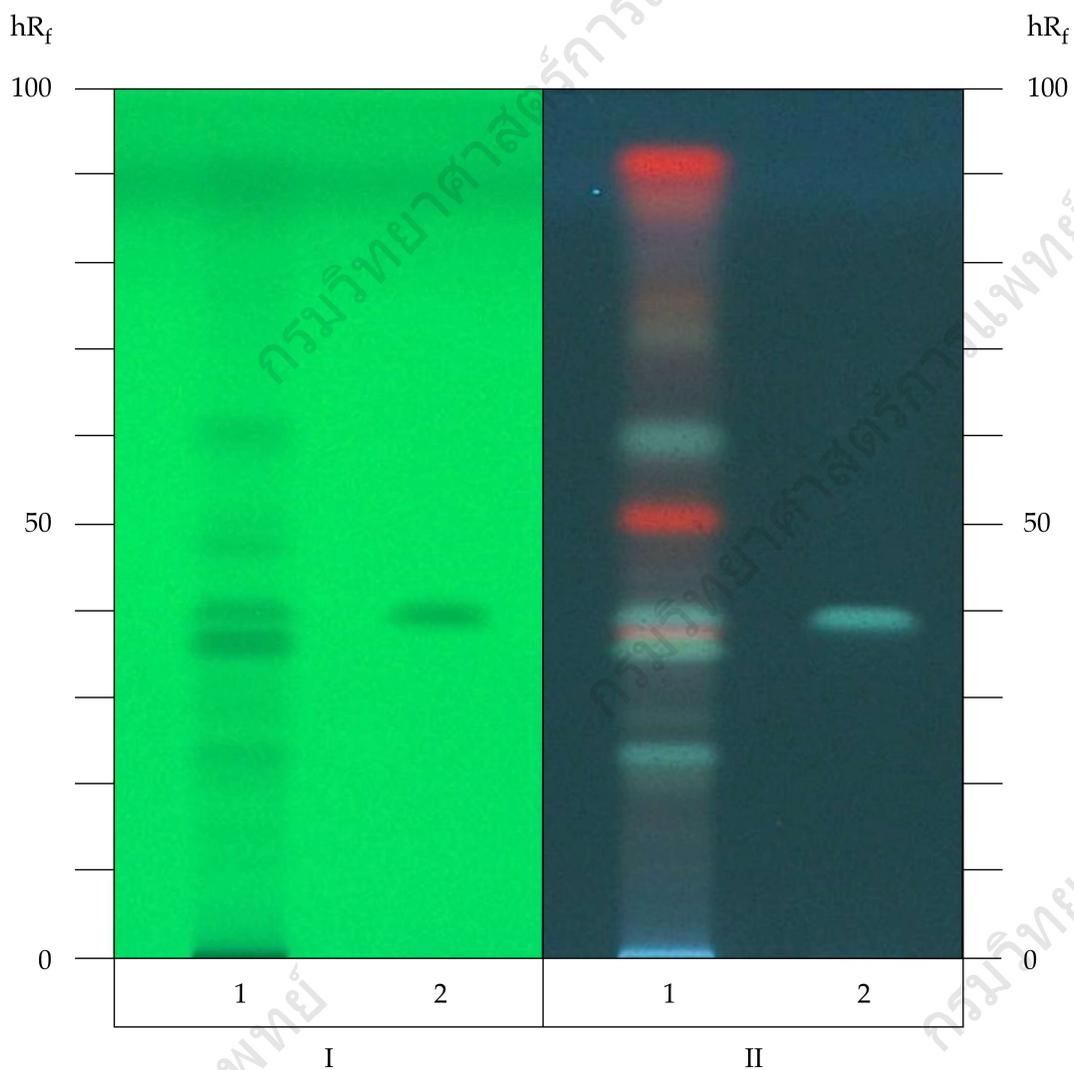
**Acid-insoluble ash** Not more than 6.0 per cent w/w (Appendix 7.6).

**Total ash** Not more than 17.0 per cent w/w (Appendix 7.7).

**Ethanol-soluble extractive** Not less than 6.0 per cent w/w (Appendix 7.12).

**Water-soluble extractive** Not less than 13.0 per cent w/w (Appendix 7.12).

**Volatile oil** Not less than 0.5 per cent v/w, calculated on the anhydrous basis (Appendix 7.3H). Use 20 g, in *fine powder*, freshly prepared and accurately weighed. Use 250 mL of *water* as the distillation liquid and a 500-mL round-bottomed flask. Distil at a rate of 2 to 3 mL per minute for 5 hours. Use 2.0 mL of *xylene* in the graduated tube.



**Fig. 3** Thin-Layer Chromatogram of Methanolic Extract of the Leaves of *Blumea balsamifera* (L.) DC.

1 = solution (A)

2 = solution (B)

I = detection under UV light (254 nm)

II = detection under UV light (366 nm) after spraying with a 1 per cent w/v solution of *aluminium chloride* in *ethanol*