

ทับทิม, ใบ (THAPTHIM, BAI)

มะเกลือ, ใบ (MAKO, BAI); พิล่า, ใบ (PHILA, BAI)

Punicae Granati Folium

Pomegranate Leaf

Category Antidiarrheal, antidysentery.

Pomegranate Leaf is the dried leaf of *Punica granatum* L. (*P. nana* L.) (Family Lythraceae), Herbarium Specimen Number: DMSC 5361, Crude Drug Number: DMSc 1252.

Constituents Pomegranate Leaf contains tannins, sterols (e.g., β -sitosterol and stigmasterol), and phenolic acids. It also contains flavonoids, terpenoids, etc.

Description of the plant (Fig. 1) Deciduous tree or shrub, 1.5 to 7(–10) m tall, much-branched, especially near base; bark dark grey, glabrous; branches opposite, slender, 4-angled when young, becoming terete with age; branchlet usually ending in spine or sometimes leaf-bearing. Leaves simple, opposite or subopposite, lanceolate, elliptic-oblong or oblong, 1 to 9 cm long, 0.5 to 2.5 cm wide, apex acute, obtuse or emarginate, base cuneate or attenuate, margin entire, slightly wavy, or serrulate, upper surface glabrous, shiny, lower surface with prominent midrib; petiole 0.2 to 1 cm long. Flowers solitary or in terminal and axillary cluster of 1 to 6; sessile or subsessile; calyx tube orange-red or pale yellow, campanulate to urceolate, 2 to 3 cm long, 1 to 1.5 cm wide, lobes 5 to 9, triangular; petals 5 to 9, obovate, apex obtuse, thin and crinkled, red, white or variegated; stamens numerous, included or exerted, filaments unequal, anther yellow; ovary inferior, glabrous, 8- to 13-loculed, each locule with numerous ovules. Fruit a berry, globose with persistent calyx at apex, 5 to 13 cm in diameter, varied in colour, from yellow green, red, to black-violet. Seeds numerous, obpyramidal, juicy, red, pink, or yellowish sarcotesta.

Description Odour, characteristic; taste, slightly astringent.

Macroscopical (Fig. 1) A mixture of entire and broken leaves. Entire leaf, lanceolate, elliptic-oblong, or oblong, 1 to 9 cm long, 0.5 to 2.5 cm wide; apex, acute, obtuse, or emarginate, base, cuneate or attenuate, upper surface glabrous, green to brownish green, lower surface green to greyish green, with prominent midrib; petiole brown, 1 to 7 mm long.

Microscopical (Figs. 2a–2d) Transverse section of the leaf through the midrib shows upper epidermis, mesophyll, vascular tissue, and lower epidermis. Upper epidermis: a layer of thin-walled oblong cells, covered with cuticle layer. Mesophyll: palisade, 1 to 2 layers of cylindrical cells; spongy cells, irregularly shaped, loosely arranged; parenchyma, some containing prismatic or rosette aggregate crystals; and angular collenchyma in the midrib. Vascular tissue: bicollateral vascular bundle, phloem, and xylem. Lower epidermis: a layer of small epidermal cells, covered with cuticle layer, and stomata.

In surface view, the lamina shows upper epidermis and lower epidermis. Upper epidermis: polygonal or rectangular cells with cuticular striation. Lower epidermis: wavy-walled cells, and mostly anomocytic and a few anisocytic stomata with cuticular striation.

Transverse section of the petiole shows epidermis, cortex, and vascular tissue. Epidermis: a layer of elongated epidermal cells, covered with cuticle layer. Cortex: polygonal parenchyma, some containing prismatic or rosette aggregate crystals, and lamella and angular collenchyma beneath epidermal layer. Vascular tissue: bicollateral vascular bundle, phloem and xylem.

In surface view, the petiole shows rectangular epidermal cells with cuticular striation.



1



2



3



4

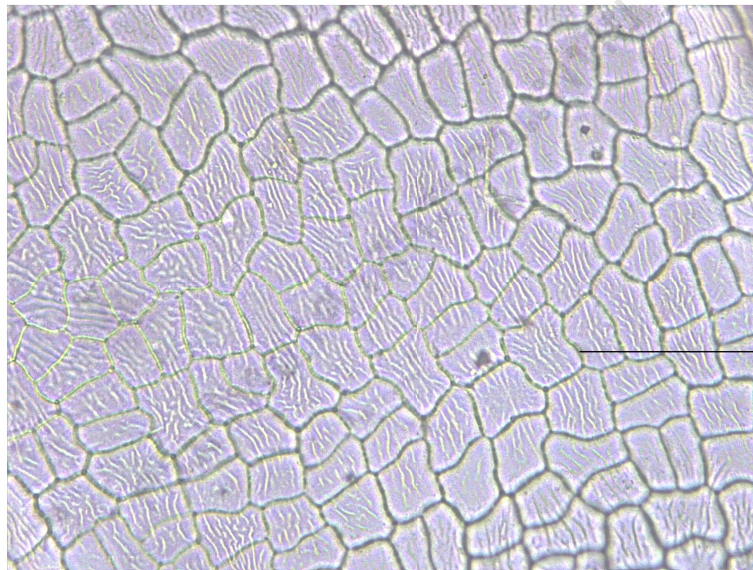


1 cm

5

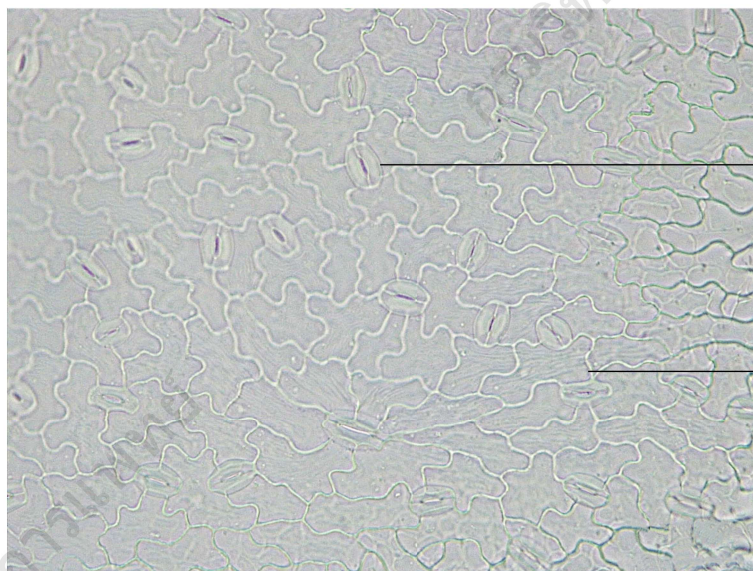
Fig. 1 *Punica granatum* L.

1. habit 2. leafy twig 3. flowers 4. fruits 5. crude drug



50 μm

Upper Epidermis of the Lamina



50 μm

Lower Epidermis of the Lamina

Fig. 2a Photomicrographs of Epidermises of the Leaf of *Punica granatum* L.
1. epidermis with striation 2. anomocytic stoma

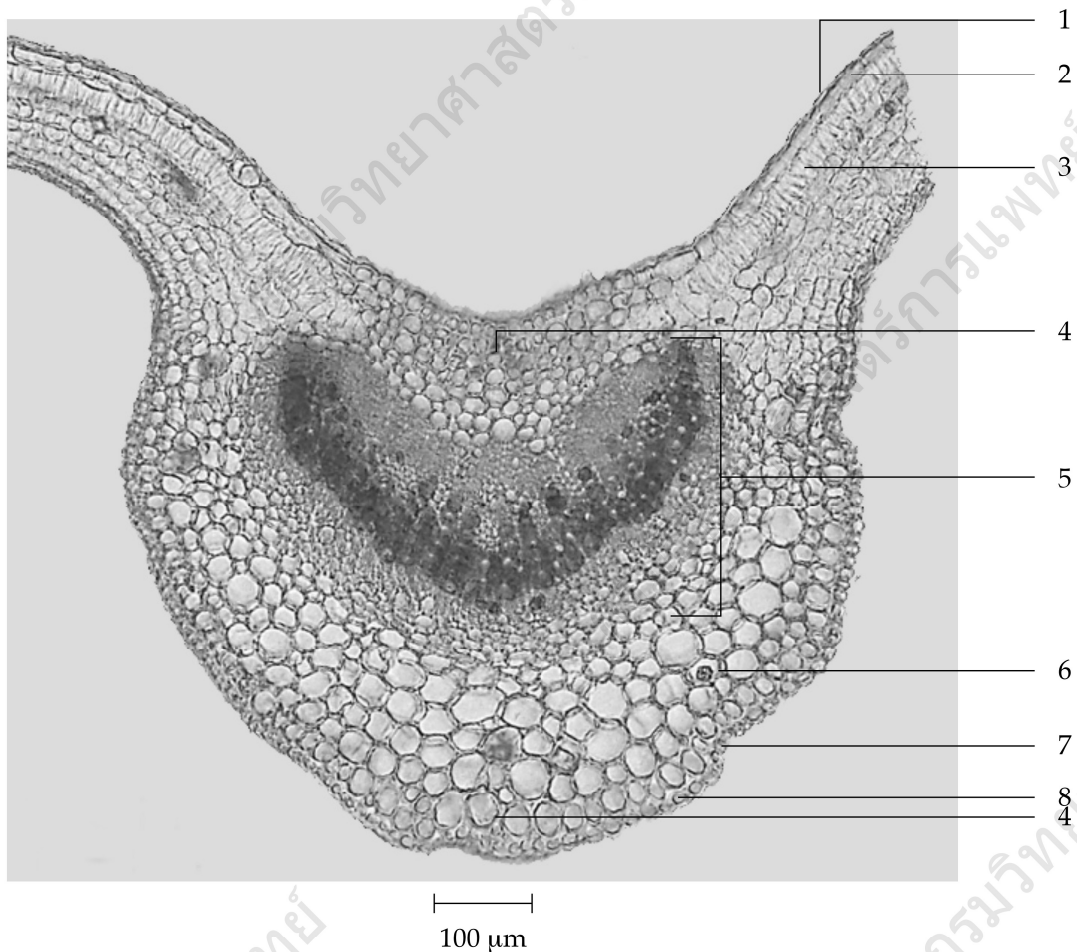


Fig. 2b Photomicrograph of Transverse Section of the Leaf Through the Midrib of *Punica granatum* L.

- | | |
|------------------------|---|
| 1. cuticle | 6. parenchyma containing rosette aggregate crystals |
| 2. upper epidermis | 7. stoma |
| 3. palisade cell | 8. lower epidermis |
| 4. angular collenchyma | |
| 5. vascular tissue | |

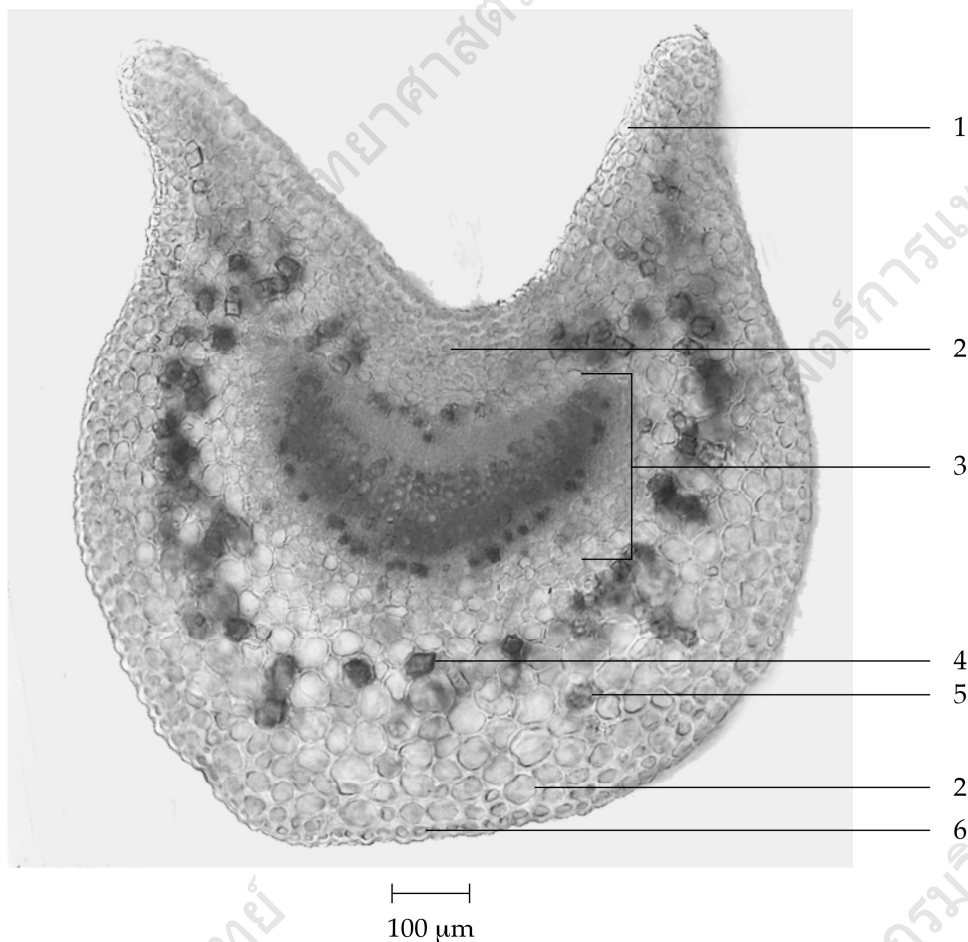


Fig. 2c Photomicrograph of Transverse Section of the Petiole of *Punica granatum* L.

- | | |
|--|--|
| 1. upper epidermis | 5. parenchyma containing rosette aggregate crystal |
| 2. collenchyma | |
| 3. vascular tissue | 6. lower epidermis |
| 4. parenchyma containing prismatic crystal | |

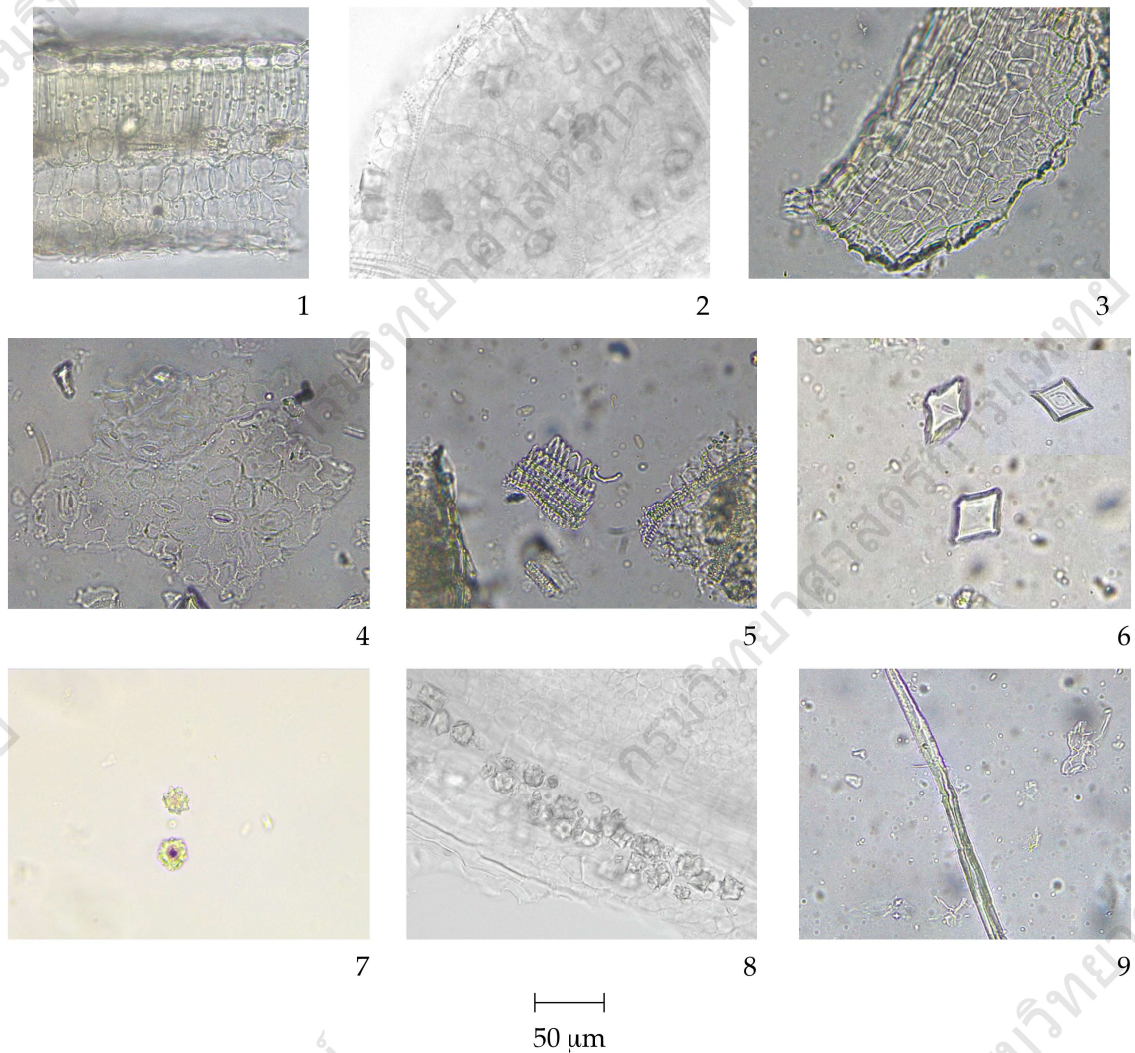
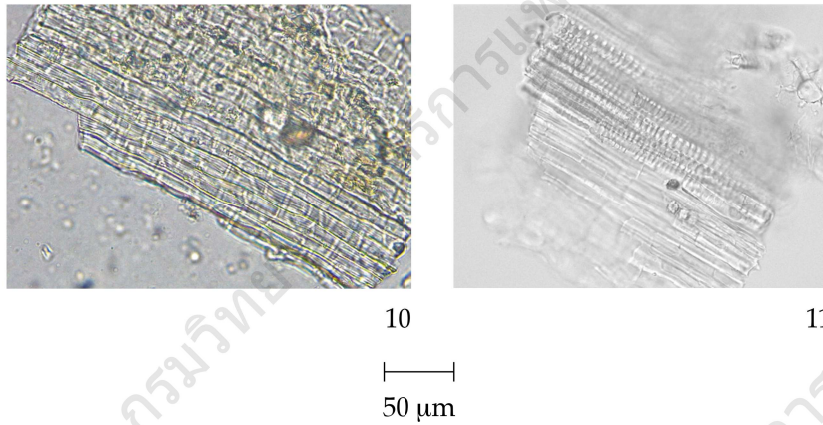


Fig. 2d Photomicrographs of Powdered Drug of the Leaves of *Punica granatum* L.

1. lamina in sectional view
2. part of mesophyll, in surface view, containing palisade cells, fibres, vessels, and prismatic and rosette aggregate crystals
3. upper epidermis of the lamina, in surface view, showing cuticular striations and stomata
4. lower epidermis of the lamina, in surface view, showing stomata
5. reticulate and spiral vessels associated with parenchyma
6. prismatic crystals
7. rosette aggregate crystals
8. parenchyma containing rosette aggregate crystals
9. fibre

**Fig. 2d** (continued)

10. epidermis of the petiole, in surface view, showing cuticular striation

11. petiole, in longitudinal view, showing reticulate and spiral vessels, and parenchyma, some containing rosette aggregate crystals

Pomegranate Leaf in powder possesses the diagnostic microscopical characters of the unground drug. Vascular tissue, particularly reticulate and spiral vessels, and prismatic and rosette aggregate crystals, can be found in abundance. Thick cuticle layer of epidermis with prominent striation can be distinctive.

Packaging and storage Pomegranate Leaf shall be kept in well-closed containers, protected from light, and stored in a dry place.

Identification

A. Heat 1 g of the sample, in powder, with 10 mL of *water* on a water-bath for 20 minutes and filter (solution 1). To 1 mL of solution 1, add a few drops of a 1 per cent w/v solution of *gelatin*: an off-white precipitate is produced.

B. To 1 mL of solution 1, add a few drops of a 1 per cent w/v solution of *iron (III) chloride*: a blue precipitate is produced.

C. Carry out the test as described in the “Thin-Layer Chromatography” (Appendix 3.1), using *silica gel G* as the coating substance and a mixture of 80 volumes of *n-hexane* and 20 volumes of *ethyl acetate* as the mobile phase and allowing the solvent front to ascend 8 cm above the line of application. Apply to the plate as a band of 10 mm, 10 μ L of the test solution prepared by sonicating 1 g of the sample, in *No. 250 powder*, with 10 mL of *ethanol* for 30 minutes, centrifuging at $9200 \times g$ (10,000 rpm) for 5 minutes, and using the supernatant. After removal of the plate, allow it to dry in air. Spray the plate with *anisaldehyde TS* and heat at 105° for 10 minutes; the chromatogram obtained from the test solution shows nine violet bands (Fig. 3).

Alternatively, using *silica gel G* as the coating substance and a mixture of 80 volumes of *dichloromethane* and 20 volumes of *ethanol* as the mobile phase and allowing the solvent front to ascend 8 cm above the line of application. Apply to the plate as a band of 10 mm, 10 μ L of the test solution prepared by sonicating 1 g of the sample, in *No. 250 powder*, with 10 mL of *ethanol* for 30 minutes, centrifuging at $9200 \times g$ (10,000 rpm) for 5 minutes, and using the supernatant. After removal of the plate, allow it to dry in air. Spray the plate with *anisaldehyde TS* and heat at 105° for 10 minutes; the chromatogram obtained from the test solution shows two brown and five violet bands (Fig. 3).

Loss on drying Not more than 8.0 per cent w/w after drying at 105° to constant weight (Appendix 4.15).

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

Total ash Not more than 9.0 per cent w/w (Appendix 7.7).

Ethanol-soluble extractive Not less than 15.0 per cent w/w (Appendix 7.12).

Water-soluble extractive Not less than 27.0 per cent w/w (Appendix 7.12).

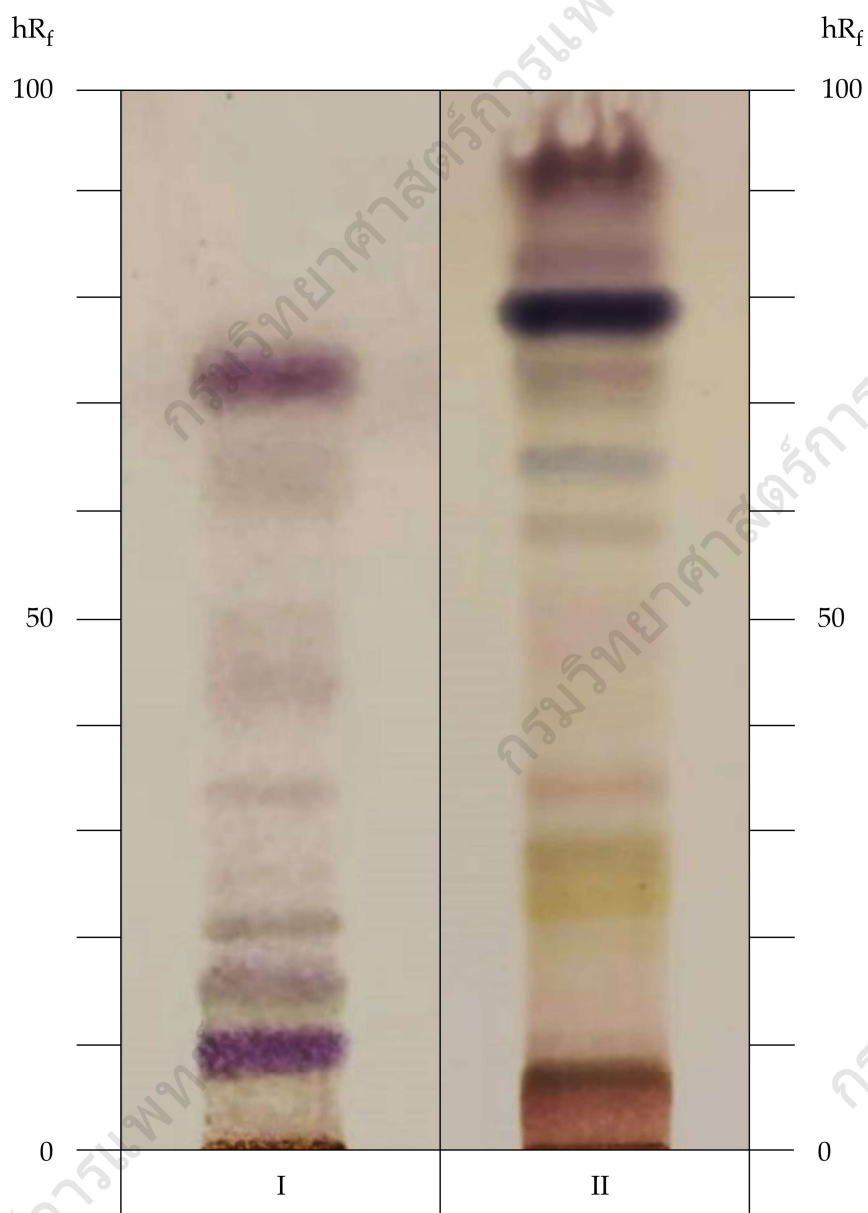


Fig. 3 Thin-Layer Chromatogram of Ethanolic Extract of the Leaves of *Punica granatum* L., Detected With *Anisaldehyde* TS

- I = a mixture of 80 volumes of *n-hexane* and 20 volumes of *ethyl acetate* as the mobile phase
- II = a mixture of 80 volumes of *dichloromethane* and 20 volumes of *ethanol* as the mobile phase