

**GREATER PLANTAIN
FOR HOMOEOPATHIC PREPARATIONS**

**PLANTAGO MAJOR
FOR HOMOEOPATHIC PREPARATIONS**

Plantago major ad praeparationes homoeopathicas

DEFINITION

Whole, fresh, blooming plant, *Plantago major* L.

CHARACTERS

Macroscopic and microscopic characters described under identification tests A and B.

IDENTIFICATION

- A. Perennial plant with a short and thick rootstock giving birth to numerous roots. All the leaves are radical, displayed in rosette, dark green, broadly ovate, entire with a long petiole, slightly winged and up to about 30 cm long. Lamina slightly pubescent, marked by 5-7 longitudinal, prominent veins on the underside. In the middle of the rosette, floral scape 10-50 cm high, bare, ending in an elongated, cylindrical spike, loose at the base. Flowers surrounded by ovate, obtuse, slightly scarious bracts, green on the backside corresponding to half the rounded sepals. Convex, floral receptacle, bearing 4 triangular, oval sepals, diagonally arranged and slightly fused at the base. Greyish corolla, glabrous with 4 obtuse lobes. Four stamens bearing brown anthers. Capsule with pyxidary dehiscence, containing 8-16 small, ovoid and angular seeds.
- B. Take a fragment of abaxial epidermis of the leaf. Examine under a microscope, using *chloral hydrate solution R*: epidermis covered with a thin, striated cuticle and composed of polygonal cells, anomocytic or anisocytic stomata (2.8.3) and trichomes; covering trichomes about 200 µm long, multicellular with pitted cell-walls with a stocky base and terminal cell narrowed and tapered; glandular trichomes, about 30 µm long with unicellular foot and ovoid, bicellular to multicellular head.

TESTS

Foreign matter (2.8.2): maximum 5 per cent.

Loss on drying (2.2.32): minimum 60.0 per cent, determined on 5.0 g of finely-cut drug, by drying in an oven at 105 °C for 2 h.

The General Chapters and General Monographs of the European Pharmacopoeia and Preamble of the French Pharmacopoeia apply.

STOCK

DEFINITION

Greater plantain mother tincture complies with the requirements of the general technique for the preparation of mother tinctures (see *Homoeopathic Preparations (1038)* and French Pharmacopoeia Supplement). The mother tincture is prepared with ethanol (65 per cent V/V), using the whole, fresh, blooming plant, *Plantago major* L.

Content: minimum 0.02 per cent *m/m* of aucubin ($C_{15}H_{22}O_9$; M_r 346.3).

CHARACTERS

Appearance: light brown liquid.

IDENTIFICATION

Examine the chromatograms obtained with the test of mother tincture of lanceolate plantain.

Results: see below the sequence of zones present in the chromatograms obtained with the reference solution and the test solution. Furthermore other faint zones may be present in the chromatogram obtained with the test solution.

Top of the plate	
----- Acteoside: a yellow zone -----	----- -----
Aucubin: a blue zone	A blue zone (aucubin)
Reference solution	Test solution

TESTS

Ethanol (2.9.10): 60 per cent V/V to 70 per cent V/V.

Dry residue (2.8.16): minimum 1.2 per cent *m/m*.

Mother tincture of lanceolate plantain. Thin-layer chromatography (2.2.27).

Test solution. Mother tincture.

Reference solution. Dissolve 10 mg of *aucubin R* and 10 mg of *acteoside R* in 10 mL of a mixture of 30 volumes of *water R* and 70 volumes of *methanol R*.

Plate: TLC silica gel plate *R*.

Mobile phase: glacial acetic acid *R*, anhydrous formic acid *R*, water *R*, ethyl acetate *R* (11:11:27:100 V/V/V/V).

The General Chapters and General Monographs of the European Pharmacopoeia and Preamble of the French Pharmacopoeia apply.

Application: 20 µL as bands.

Development: over a path of 8 cm.

Drying: after development, heat immediately at 100-105 °C for 5-10 min.

Detection: examine in daylight.

Results: the presence of a yellow zone (acteoside) in the chromatogram obtained with the test solution shows adulteration by the mother tincture of *Plantago lanceolata* L.s.l.

ASSAY

Liquid chromatography (2.2.29).

Test solution. In a 25.0 mL volumetric flask, place a sample of about 5.000 g of mother tincture accurately weighed and dilute to 25.0 mL with the mobile phase.

Reference solution. In a 100.0 mL volumetric flask, dissolve 0.010 g of *aucubin R* in the mobile phase and dilute to 100.0 mL with the same solvent.

Column:

- size: $l = 0.25$ m, $\varnothing = 4.6$ mm,

- stationary phase: octadecylsilyl silica gel for chromatography R (5 µm),

Mobile phase: acetonitrile R, water R (3:97 V/V).

Flow rate: 0.5 mL/min.

Detection: spectrophotometer at 204 nm.

Injection: 20 µL.

Calculate the percentage content m/m of aucubin, from the expression:

$$\frac{A_1 \times m_2 \times 0.25 \times p}{A_2 \times m_1}$$

A_1 = area of the peak due to aucubin in the chromatogram obtained with the test solution,

A_2 = area of the peak due to aucubin in the chromatogram obtained with the reference solution,

m_1 = mass of the mother tincture sample, in grams,

m_2 = mass of aucubin sample in the reference solution, in grams,

p = percentage content m/m of aucubin in *aucubin R*.

The General Chapters and General Monographs of the European Pharmacopoeia and Preamble of the French Pharmacopoeia apply.