

A NOTE ON *PLANTAGO MAJOR* SEEDS: A SUBSTITUTE FOR ISPAGHULA

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The pharmacognostical features of the seeds of *Plantago major*, a substitute of "Ispaghula" (*P. ovata*) are described and illustrated, and points of difference indicated.

THE seeds of *Plantago major* Linn. known as "Lahuriya" in Hindi and "Bartang" in Persian, are used for a variety of ailments and have been claimed by various authors on indigenous drugs (Kritikar and Basu, 1933; Chopra, Handa and Kapur, 1958; Mukerji, 1953; Khan, 1917) to be good substitute for *Plantago ovata* seeds (ispaghula), which are considered as a remedy for dysentery and chronic diarrhoea and are official in Indian Pharmacopoeia (1955) and British Pharmaceutical Codex (1959).

Controversy has existed about the botanical origin of *P. major* seeds. Some of the earlier workers attributed the seeds to *P. psyllium* and *P. lanceolata*. This confusion was rectified by Skyrme (1935) who germinated the seeds and identified the grown plants. This was confirmation of the observation of Thiselton-Dyer (1884), who identified the plants grown at Kew, from the seeds, as *P. major*. Further confirmation has been obtained in this work by comparison of commercial samples from a number of sources with the seeds of *P. major* plants, growing wild at Mussoorie and in Kashmir, which have been identified. The seeds agreed both in morphological and anatomical characters.

Further, it has been found that the seeds of *P. major* possess much less mucilage than those of *P. ovata* and hence claims of usefulness do not seem to be well founded. However, Wasicky (1961) reported that the Brazilian *P. major* var. *Cruenta* swelled the most in a comparison with *P. ovata* (= *P. ispaghula* Roxb.) and *P. psyllium* and hence to be most effective as laxative.

The seeds of *P. major* are reported to contain (Wehmer, 1931) 18.8 per cent crude protein, 19 per cent crude fibre, 10-20 per cent fatty oil, 8.25 per cent water and 5 per cent ash. Ogata and Nishioja (1924) isolated from the seeds not only a glucoside but also choline and succinic and platenollic acids.

The pharmacognosy of *P. ovata*, *P. psyllium* and *P. indica* is already known (Trease, 1958; Wallis, 1960; and others). However, no work on *P. major* which is commonly used in India and elsewhere has been reported.

MATERIAL AND METHODS

Samples of the seeds were obtained from different drug dealers in India and also from plants growing wild in Kashmir and Mussoorie.

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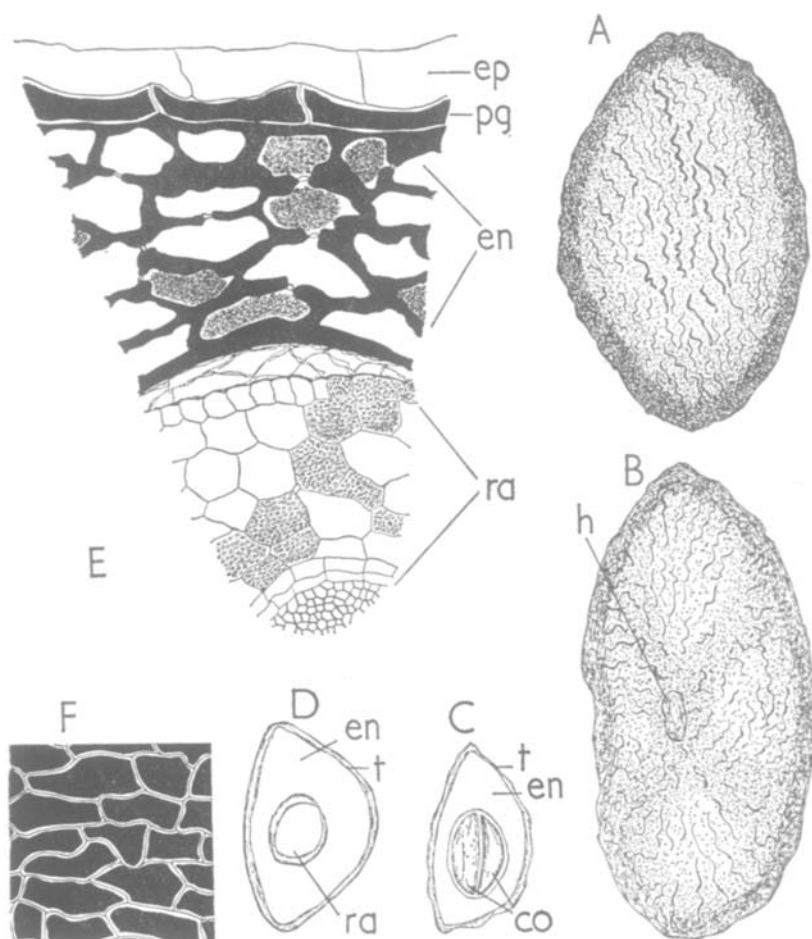


FIG. 1. Seed of *Plantago ovata*: A, dorsal view $\times 50$. B, ventral view $\times 100$. C, cut in middle $\times 25$. D, cut at one end $\times 25$. E, transverse section $\times 400$. F, pigment layer in surface view $\times 150$. co, cotyledons; en, endosperm; ep, epidermis; h, hilum; pg, pigment layer; ra, radicle; t, testa.

Usual methods of sectioning and staining were employed. The methods used for determination of ash contents and swelling factor were those of Indian Pharmacopoeia (1955).

The plant (Fitch and Smith, 1949; Sowerby, 1867), a native of Europe and introduced into India is found growing in the temperate Himalaya from Kashmir to Bhutan at altitudes of 5–2,300 m., in western Tibet at 29–3,600 m., China, in Khasi hills at 12–1,400 m., Aka hills, Konkan, Mahabeshwar and Poona in the Deccan. It is a small perennial herb, up to 37 cm. high with rootstock short, truncate; leaves all radical, alternate, subacute, or obtuse, base tapering and decurrent into the long sheathing petiole, oblong or oblong-ovate, sub-entire or toothed;

scape short; spike very long and slender, lax, cylindrical; flowers small, green, ovary two celled, four to eight seeded; seeds minute, angled, dull black, rugulose.

Macroscopy

The seeds are minute and variable in shape and size, being 0.8–1.5 mm. long and 0.48–0.8 mm. broad. They vary in colour from light brown to dark brown or almost black. The seeds exhibit a variable outline. They are ovate, or ovate with obliquely truncated apex or irregular in outline (Fig. 1A). This variation may be accounted for by the compact arrangement of 8 to 16 seeds in each capsule. The seeds are more or less planoconvex. In the centre of the ventral or the plane surface (Fig. 1B) there is a depressed oval area on one side of which the hilum is located as a light coloured dot. The surface of the seed shows beautiful ripple-like markings of a darker colour (Fig. 1A,B). These markings are wavy elevated ridges on the surface and their arrangement differs on the two surfaces. On the dorsal surface the ridges run in the direction of the longer axis of the seed (Fig. 2A). On the ventral surface they radiate outward from the hilar depression (Fig. 1B). On soaking in water, the seed coat swells and the seeds become enveloped with a colourless mucilage. The seeds possess a slightly bitter and oily taste. The mucilaginous taste is not well marked. The commercial samples show much debris which includes dehisced capsules and dissepiments.

TABLE I
FEATURES DISTINGUISHING *Plantago major* FROM ISPAGHULA

	<i>Plantago major</i>	<i>Plantago ovata</i>
Colour	Light brown to dark brown or almost black.	Dull; pinkish grey-brown.
Shape	Irregular in outline; ovate or ovate with obliquely truncated apex.	Boat-shaped; outline ovate
Dorsal surface	Convex with beautiful ripple-like markings of a darker colour.	Convex with a small elliptical or elongated shining reddish-brown spot.
Ventral surface	Almost plain, with depressed oval area in the centre, and with ripple-like markings of a darker colour all over.	Concave with a deep furrow, not quite reaching either end of the seed.
Size—		
Length	0.8–1.5 mm.	2.0–3.3 mm.
Breadth	0.42–0.8 mm.	1–1.6 mm.
Taste	Slightly bitter and oily	Mucilaginous
Weight of 100 seeds	0.0202–0.024 g.	0.15–0.19 g.
Swelling factor	4.37–5	10.25–13.50
Ash	Not more than 4.8 per cent	Not more than 3 per cent
Acid-insoluble ash	Not more than 0.8 per cent	Not more than 0.6 per cent

Microscopy

The testa is composed of 2 layers of cells (Fig. 1E).

The epidermis. This is a single layer of translucent thin-walled cells wherein the mucilage is found. The cells are rectangular, being elongated in the tangential direction (Fig. 1E). The mucilage takes a red colour with safranin; no lamellate appearance is observed.

Pigment layer. This layer is also composed of rectangular cells, the outer tangential walls of which bulge slightly to the inside. The radial

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walls thus project outward prominently (Fig. 1E). The cells are filled with brownish pigment and measure T, 35—44—66 μ and R, 12—14—18 μ . In surface view, the pigment layer cells are irregularly rectangular to polygonal in outline (Fig. 1F) and measure 17—55—90 μ in diameter.

Endosperm. This forms the major part of the seed and completely surrounds the embryo (Fig. 1C,D). The cells show highly thickened cellulosic walls having pores for communication between the adjacent cells (Fig. 2E). The cell lumen is filled with fixed oil and protein. The cells measure 35—44—54 μ in diameter.

Embryo. The embryo is straight and lies in the middle along the long axis of the seed. The radicle is circular in transverse section (Fig. 1D) while the two cotyledons are planoconvex (Fig. 1C). The cells are parenchymatous and measure 16—20—28 μ in diameter. They are packed with aleurone grains.

One g. of *Plantago major* seeds when subjected to the absorbency test of the B.P.C. 1949 gave volume of not more than 5 ml. The seeds yielded not more than 4.8 per cent of total ash and not more than 0.8 per cent of acid-insoluble ash.

Points of distinction from isphagula are summarised in Table I.

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