

Datura sanguinea R. and P., its seeds

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The seeds of the Peruvian plant *Datura sanguinea* R. and P. contain hyoscyne and are used in Peru as stramonium is used in Britain. Their structure is described and is compared with that of the seeds of stramonium and of *D. fastuosa* with a view to their identification either unground or in powder.

SOME years ago the seeds of *Datura sanguinea* R. and P. were examined by Drey & Foster (1953) for their content of solanaceous alkaloids and were found to contain about 0.172% total alkaloid which was almost entirely hyoscyne. These seeds have been used in Peru since early times and J. Lindley in *The Vegetable Kingdom* (1847) when discussing the uses of seeds of *Datura* spp. especially *D. tatula* and *D. metel*, gives the following information "the seeds are the most powerful part of these plants, and are stated by some authors to have been used by the priests of the Delphic Temple to produce those frenzied ravings which were called prophesies. Such a practice certainly obtains, or obtained, in the Temple of the Sun in the city of Sagomozo, where the seeds of the Floripondio (*Datura sanguinea*) are used; the Peruvians also prepare from them an intoxicating beverage which stupifies if taken much diluted; but, when strong, brings on attacks of furious excitement."

MATERIAL

The seeds used for this investigation were part of the sample used by Drey & Foster for the determination of their alkaloidal content.

MACROSCOPICAL

The seeds are dark greyish brown, flattened wedge-shaped, either sub-reniform in outline with a slightly pointed end where the funicle was attached, Fig. 1 B, or the testa is extended towards the placenta giving a mutton-chop shape to the seed, Fig. 1 A; the two forms are present in about equal numbers. They are hard, about 10 mm long, 5 to 6 mm broad and 4 mm thick at the convex margin. The testa has a slightly granular surface with 4 or 5 wrinkled ridges at the thicker convex edge; the hilum is at the pointed end, see Fig. 1 A and B. The embryo, which is about 15 mm long and 1.5 mm in diameter, is embedded in a white oily endosperm and is narrowly cylindrical with the hypocotyl-radicle pointing towards the hilum and the two narrow cotyledons, placed face to face and curved until their tips nearly meet the radicle, see Fig. 1 E, F and G. The seeds are odourless and have a bitter taste; 100 seeds weigh about 4.0 g.

From the Museum of the Pharmaceutical Society of Great Britain, London, W.C.1.

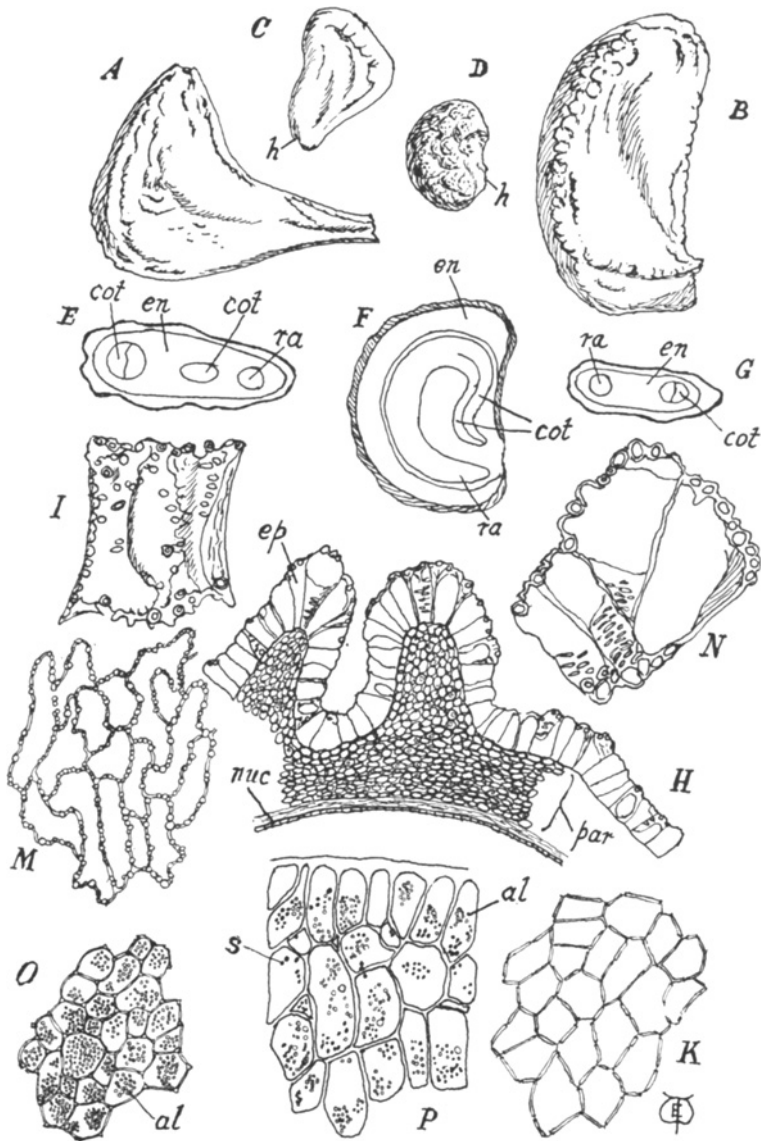


FIG. 1. Seeds of *D. sanguinea* R. and P., A, mutton-chop shape and B, reniform shape; C, seed of *D. fastuosa*; D, seed of *D. stramonium*. E to P, seed of *D. sanguinea*, E, longitudinal section; F, section parallel to the flat faces; G, transverse section; I, epidermal cell from the flat face in vertical section; N, epidermal cells from summit of a ridge in vertical section; H, transverse section of the testa; K, nucellus, surface view; M, epidermis in surface view from flat face; O, epidermis of the endosperm; P, transverse section of the endosperm; al, aleurone grain; cot, cotyledon; en, endosperm; ep, epidermis; h, hilum; nuc, nucellus; par, parenchyma; ra, radicle; s, starch. A to G, $\times 4$; I and N, $\times 100$; M and H, $\times 40$; O, P and K, $\times 175$.

DATURA SANGUINEA R. AND P., ITS SEEDS

MICROSCOPICAL

Testa. The seed has one seed-coat—the testa. The epidermal cells of the flat surfaces in surface view have irregularly wavy and pitted anticlinal walls with superior outgrowths or processes interlocking with those of neighbouring cells; there are similar, less thickened, processes from the base of the cells, Fig. 1 I. The cells vary in length from about 110 to 375 to 720 μ and about 40 to 60 to 100 μ wide, the width often varying much in the same cell; their height is about 125 to 150 μ ; in vertical section they are sub-rectangular. On the ridges at the edges of the seed, where the testa is strongly folded over the ridges, the shape of the epidermal cells is modified; here in vertical section they are triangular in outline, Fig. 1 N, and of much greater height measuring about 250 to 275 μ ; in surface view they are sub-rectangular about 85 to 250 to 325 μ long by 50 to 65 to 100 μ wide and the anticlinal walls have much less prominent processes. The thickness of the walls of all the epidermal cells is about 8 to 10 μ and the bases of all the epidermal cells are pitted with oval pits. Beneath the epidermis are about 12 to 15 layers of parenchyma consisting of thin-walled rounded cells, about 30 to 45 to 60 μ in diameter, having circular or oval pits in their walls; this is followed by a layer about 30 μ wide of collapsed cells and a well-marked epidermis of the nucellus consisting of rectangular tabular cells about 30 to 40 to 60 μ long and about 20 μ high in transverse section and in surface view sub-rectangular and about 38 to 45 μ in either direction, Fig. 1 K. All the cells of the testa and of the nucellus are lignified.

Endosperm. The endosperm is composed of polyhedral to rounded cells about 40 to 60 to 80 μ in diameter with a few small intercellular spaces. They contain fixed oil as an oil-plasma and numerous small aleurone grains measuring about 3 to 6 μ , most of them being small and amorphous and some of the larger ones enclosing a crystalloid and one or more minute globoids. A few small starch granules, mostly measuring about 4 μ , are present in many of the cells, being starch which has not been converted into oil (Jost & Gibson, 1907). The aleurone grains and the starch are best observed by mounting a defatted section in iodine water. In a section mounted and warmed in water, very numerous globules of oil separate from the plasma and are stained deep red by tincture of alkanet, Fig. 1 O and P.

Embryo. The embryo consists of cells rather smaller than those of the endosperm, about 20 to 40 μ in diameter; palisade and procambium are all evident in the embryo. The cell contents are similar to those of the endosperm.

COMPARISON WITH SEEDS OF OTHER SPECIES OF *Datura*

The unground seeds of species of *Datura* used medicinally are easily recognised as shown in Fig. 1 A, B, C and D, where seeds of three medicinal species are drawn to the same scale. Seeds of *D. stramonium* are reniform, nearly black and 100 seeds weigh about 0.85 g; seeds of *D. fastuosa* are ear-shaped, brownish yellow and have about the same weight as seeds of *D. stramonium*. As stated above, the seeds of *D. sanguinea*

are much larger, dark greyish brown, sub-reniform to mutton-chop shaped and 100 weigh about 4.0 g.

The powders of these seeds may be distinguished by the characters of the epidermis, see Fig. 2.

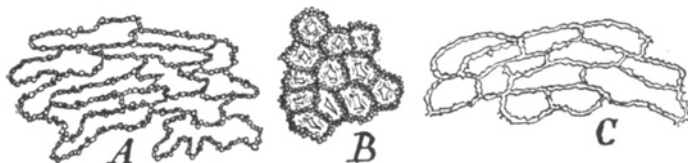


FIG. 2. A, epidermis of flat face of seed of *D. sanguinea*; B, epidermis of seed of *D. stramonium*; C, epidermis from a ridge of the seed of *D. sanguinea*; All $\times 40$.

(1) *D. stramonium*. The epidermal cells are darkly pigmented, polygonal in surface view, measure about 95 to 125 to 160 μ and have numerous small superior outgrowths. These cells also have a band of very heavy thickening in the equatorial position giving a lumen of a somewhat hour-glass shape (Moll & Janssonius, 1923) which appears stellate in surface view.

(2) The epidermal cells of *D. fastuosa* closely resemble those of *D. stramonium*; they are less pigmented and are slightly larger, measuring up to 190 μ (Timmerman, 1927).

(3) The epidermal cells of *D. sanguinea* from the flat surfaces are narrow and much elongated, about 320 to 720 μ by 50 to 80 μ , with irregularly wavy walls; those from the ridges are sub-rectangular, about 80 to 300 μ by 50 to 100 μ . There is no equatorial band of heavy thickening.

References

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