NOTE ON SOME MORE TROPICAL LABYRINTH-SEEDS

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There are seeds that, when cut in any plane, show a labyrinth structure (van Heel, 1970). This may be due to folding of the cotyledons *(Burseraceae, Dipterocarpaceae)*, or to the presence of testa tissue within the seed. In the latter case the testa tissue may either be located in the endosperm only ('ruminated seeds' in *Palmae, Annonaceae*, etc.), or the testa tissue may interfere with the cotyledons. It is possible that in some cases the testa at first interferes with the endosperm, and later on, when the embryo has become larger, also interferes with the cotyledons (Corner, 1966, in some *Palmae*).

In the case of testa tissue interfering with the cotyledons, there are probably two possibilities. Firstly the testa may be located between portions of folded and lobed, mostly flat, cotyledons — sometimes surrounded by a small amount of endosperm — *(Kingiodendron, Erycibe, Argyreia, Neokeithia)*. Secondly the testa can be located in many crevices in massive cotyledons *(Hernandia, Mangifera)*. However, it seems that a distinction among labyrinth-seeds will be rather arbitrary, as long as the precise ways of development remain unknown. It is very probable that different ontogenies may yield much resembling end-stages (Corner, 1966; van Heel, 1971; Periasamy 1962).

In addition it is unfortunate that hardly anything is known of a possible correlation between labyrinth structure and way of germination, and its possible ecological significance.

Mangifera spp., *(Anacardiaceae)*

Dr. Ding Hou drew my attention to three species of *Mangifera* which had labyrinth-seeds, whereas the other nearly thirty species of the genus had normal seeds. The species concerned were *M. inocarpoides* Merr. & Perry from Papua, *M. camptosperma* Pierre from Cambodja, and *M. gedebe* Miq. from Sumatra, Borneo, and Java (fruit of *Kostermans 14103*, L., cult. in Hort. Bogor).

One dried seed of *M. inocarpoides (Brass 8462)* was available for anatomical observations. The whole large kidney-shaped seed had a testa on the outside, which, moreover, was located in numerous crevices reaching almost up to the median plane. 'Normal' seeds, which had no albumen, could easily be severed into two cotyledons, one on each side of the median plane. However, since the labyrinth-seed presented itself as a solid mass of tissue, the question arose whether it also consisted of two cotyledons.

When a cross-section was made, a faint median line could be detected in the seed, which under the microscope proved to consist of compressed cell walls. Moreover, in some places, the line proved to consist of two flat-celled epidermides with a cuticle between them, staining positively with Sudan IV.

It could be concluded that this seed, like the normal ones, consisted of two cotyledons, which, moreover, adhered together with a common cuticular membrane in the median plane. The epidermides can be traced along the outside of the seed and along the crevices

filled with testa tissue. In contrast the ground tissue of the cotyledons consisted of large roundish cells filled with starch and of many vascular bundles, each of which with a xylem portion of spiral tracheids and a large canal at the site of the phloem. These canals were lined with small, densely staining epithelial cells and were surrounded by crushed starch cells (in *Anacardiaceae* resin canals are reported to abound in various organs). The testa tissue at this stage consists of a soft parenchyma, partly disrupted and necrosed in the middle of the crevices, on the outside forming a mantle of polygonal cells filled with a liquid substance, which become crushed near the epiderm of the cotyledons.

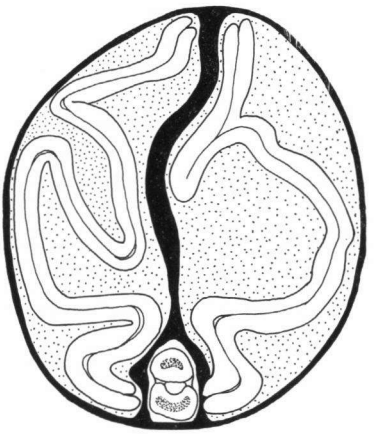

Fig. 1. *Argyreia ridleyi*, cross-section of seed, 7×.

Argyreia ridleyi (Prain) Prain *ex* Ooststr., *(Convolvulaceae)*

Dried seeds of one collection of this Malaysian plant *(Kepong F.R.I. 2634)* were used for this study. They contained embryos with two large and flat cotyledons, emarginate at the top and cordate at the base, like in so many *Convolvulaceae*. The flat cotyledons were firmly appressed to each other by their adaxial surfaces. In fact their form only showed after the embryo had been unfolded, for in the seed the embryo was bent cap-like toward one side, and the lateral parts of the cotyledons were undulating. In the figure the cross-section of the seed was made exactly above the point of insertion of the cotyledons on the embryonic axis.

The figure shows three black extensions of the testa that were fused. In the base of the seed two plates of testa tissue were located between the embryonic axis and the cordate bases of the cotyledons; they terminated at the level of insertion of the cotyledons. Then, there was another, large, plate of testa tissue in the median plane of the seed, around which the halves of the cotyledons were bent cap-shaped. This plate was limited upwards by the upper median parts of the cap-shaped embryo. The remaining space between the plates and the cotyledonary folds, was filled up with endosperm that had become jellified completely, except for scarce remains of swollen cell walls (cf. Netolitzky, 1926).

It is evident that this seed is a very simple labyrinth-seed. I described another simple case in *Erycibe tomentosa*. However, *Erycibe griffithii* turned out to be more complicated because of the stronger lobing of the cotyledons (van Heel, 1970). I expect that in the *Convolvulaceae*, with their lobed and folded cotyledons, gradations in labyrinth-seeds could be found, which would be interesting to study morphogenetically.

Rhopalocarpus spp. *(Rhopalocarpaceae)*

In his revision of the *Rhopalocarpaceae*, a family of plants from Madagascar, Capuron described and illustrated labyrinth-seeds of several *Rhopalocarpus* and *Dialyceras spp.* Especially in *R. lucidus* the two separate cotyledons were strongly lobed and the lobes laciniate. In fruits that were not yet mature, the laciniae were surrounded by albumen. In other *Rhopalocarpus spp.* the structure was less complicated. Evidently in *Rhopalocarpus* too a gradation in labyrinth structure could be found.

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