Proc. Indian natn. Sci. Acad. B51 No. 3 pp 377-380 (1985)

Vascular Supply and Structure of Hilum in the Seeds of *Dolichos lablab* Linn.

B S TRIVEDI, G D BAGCHI* and RAJNI TRIPATHI
Botany Department, Lucknow University, Lucknow 226007

(Received 18 April 1984; after revision 22 June 1985)

The paper deals with the vascular supply and structure of hilum in the seeds of *Dolichos lablab* Linn. (Papilionaceae).

Key Words: *Dolichos lablab*, **Hilum structure**

Introduction

Structure, morphology and vascular supply of seed coat of Leguminales have been described by Netolitzky (1926) and Corner (1951, 1976). Seeds of Papilionaceae show greater variation in vascular supply compared to Mimosaceae & Caesalpiniaceae, which may be of systematic importance. Hyde (1954) studied the structure and function of tracheid bar and hilum of seeds of two species of *Trifolium* and *Lupinus arboreus*.

The present study was undertaken, since no detailed observations have been made so far, on the vascular system of the seed and structure of hilum in *Dolichos lablab*.

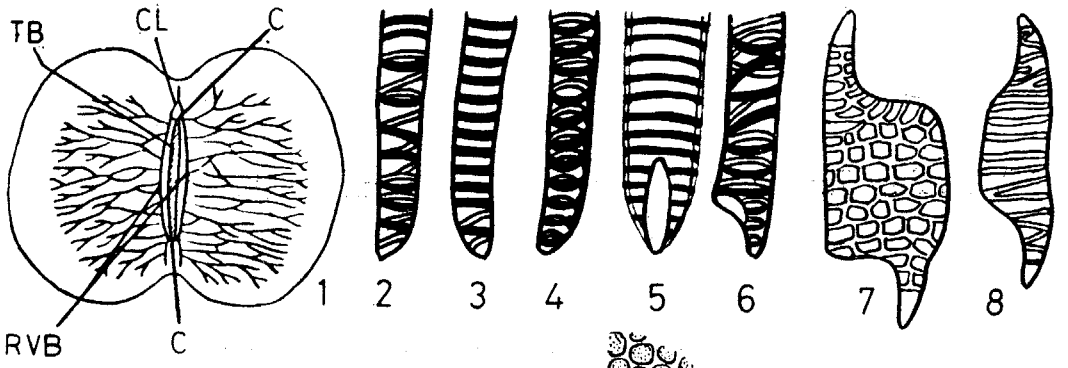
Material and Method

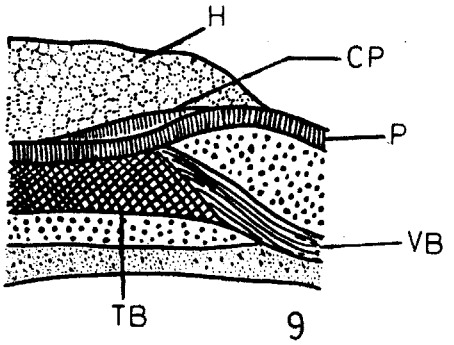
Mature seeds of *Dolichos lablab* were collected locally, fixed in F.A.A. and were dehydrated and impregnated (Johanson 1940). Sections, 8–15μm thick, were cut and stained with safranin and light green. Maceration was done by Jeffrey's method (Sass 1954). Opening and closing of hilar fissure were studied by keeping the seeds under dry and humid conditions respectively. Tracheid bar was studied by SEM (Scanned by Cambridge stereoscan, 180). Photographs were taken on 120 ASA film.

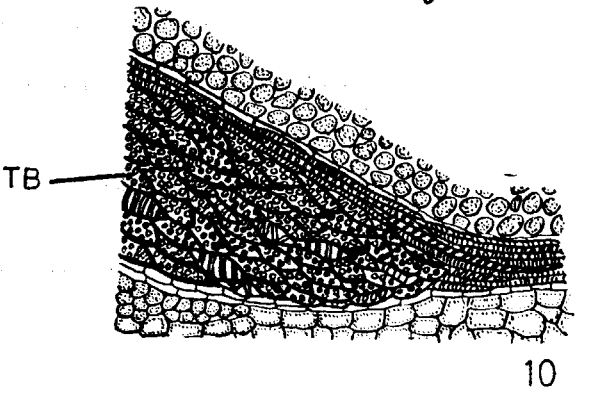
Observation

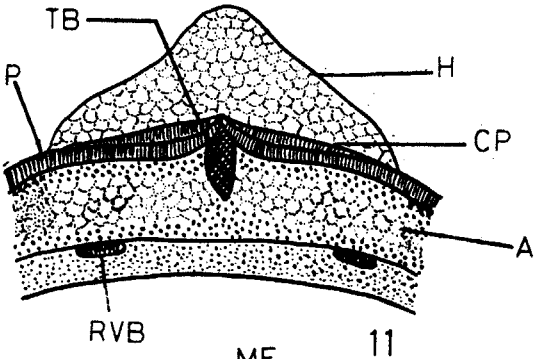
In the seeds of *Dolichos lablab*, the tracheid bar extends in the sub-hilar region from chalaza to micropyle with recurrent vascular bundles along both sides. A small connective joins these bundles at chalaza and micropyle as well as both ends of tracheid bar (figure 1). Near chalaza, recurrent vascular bundles fuse with each other to form a chalazal loop and extend as a single vascular bundle up to chalaza with no post chalazal extension

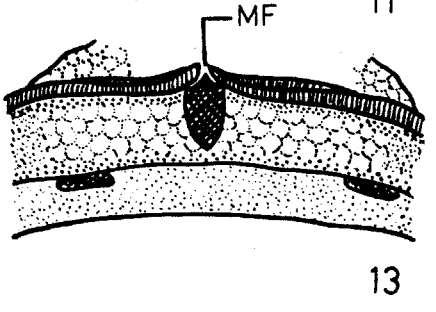
* *Present address* : CIMAP, P.B. No. 1 R.S.M. Nagar, Lucknow

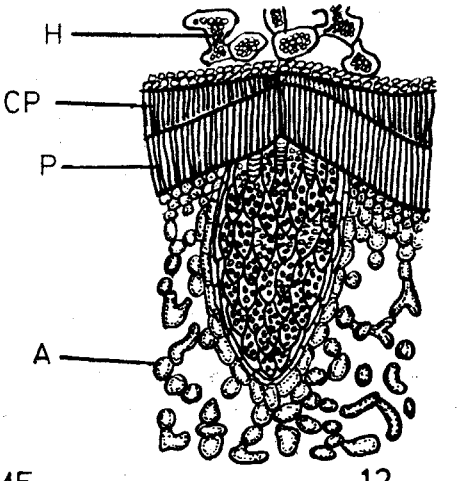


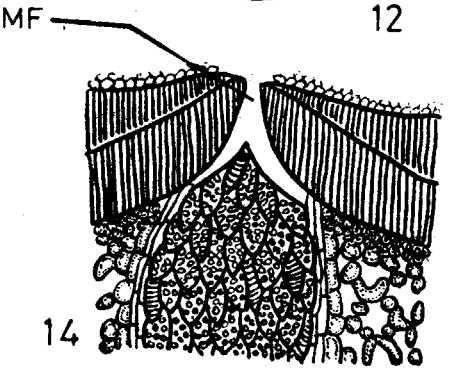










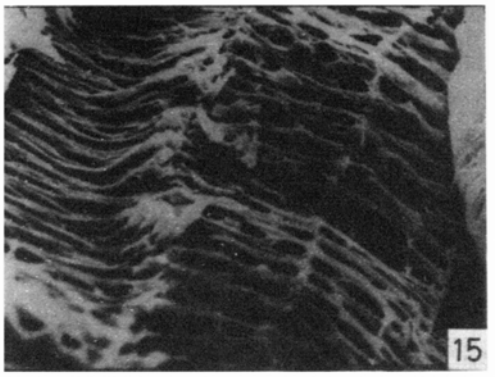


Figs 2–8 ——— 0·05 mm
Figs 9,11,13 ——— 1·00 mm
Figs 10,12,14 ——— 0·05 mm

(figure 1). Recurrent vascular bundles give rise to 11–12 pairs of anastomising (in reticulat pattern) laterals with free ends. Vascular supply of seed-coat has tracheids and vessels (with annular, spiral, scalariform and reticulate thickenings) (figures 2–6) but tracheid bar has only tracheids (figures 7–8).

Tracheid bar in *Dolichos lablab* occurs below hilar groove and differentiates later in seed development. It appears oval in cross section with its pointed end facing hilar fissure. Tracheid bar is sheathed by thin-walled narrow parenchymatous cells except towards the fissure (figures 11 & 12). Tracheids of the bar are highly irregular (figures 7 & 8) (i.e. narrow and long or broad and short) with usually reticulate (rarely scalariform) thickenings (figures 15 & 16).

When seeds are semi-dry, the hilum is covered by a white spongy parenchymatous tissue (figures 9, 11 & 12). On drying it peels off exposing the counter palisade layer to the outer environment (figures 13 & 14). When such seeds are kept in dry condition (i.e. 35–40°C) the counter palisade layer shrinks splitting up (extending up to both sides of tracheid bar through the parenchymatous sheath) the median groove to form a median fissure resulting in the desication of seeds (figure 14). When these are kept in humid condition at 10°C, the counter palisade layer starts absorbing moisture from atmosphere indicating that moisture within the seed is regulated by the hilum and enables the seed to remain viable for long.



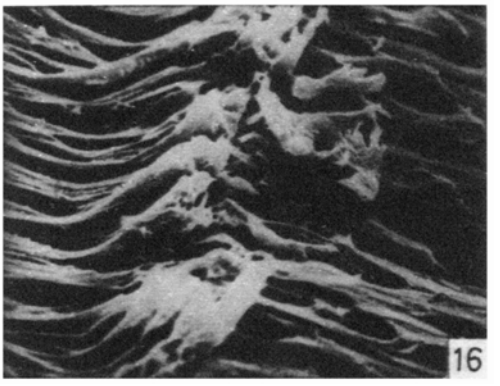


Figure 15-16, Scanning electron microphotographs showing the structure and pittings of tracheids of tracheid bar (15 × 4500, 16 × 6000)

Discussion

Vascular supply of *Dolichos lablab* and *Mucuna utilis* resemble each other. However, connections joining recurrent vascular bundles both at micropylar and chalazal ends as well as presence of chalazal loop are characteristic features of *Dolichos lablab* (Corner 1951). According to Corner (1951) short tracheids of tracheid bar have no reticulate thickening and long ones have scalariform. But in *D. lablab* there is no relation between size of the tracheid and the type of thickening (reticulate being common and scalariform present in narrow tracheids).

Figure 1 Diagramatic representation of vascular supply of *Dolichos lablab* seed coat (×4); **2–6;** Tracheids and vessels from the vascular supply of the seed coat; **7–8,** Tracheids of tracheid bar; **9,** L.S. of hilum; **10,** Portion of the same enlarged; **11,** T.S. of hilum when placed in high humidity; **12,** Portion of the same enlarged; **13,** T.S. of hilum when placed in dry condition; **14,** Portion of thesame enlarged showing hilar fissure;

A, Aerenchyma; **C,** Connective vascular bundle; **CL,** Chalazal loop; **CP,** Counter palisade layer; **H,** Hilar tissue; **MF,** Median fissure; **P,** Palisade layer; **RVB,** Recurrent vascular bundle; **TB,** Tracheid bar; **VB,** Vascular Bundle

Hilar tissue in *Trifolium* and *Lupinus* is not as much developed as in *D. lablab* and remains attached with the hilum even in fully mature dry seeds. Hyde (1954) while studying the function of hilum in these seeds reported that it works as hygroscopic valve and when the counter palisade layer shrinks, it splits the tracheid bar and hilar tissues from the middle. But in *D. lablab*, hilar tissue is quite thick and thus the shrinkage of counter palisade layer does not break it. However, when the seed becomes completely dry, the hilar tissue itself gets peeled off from the hilum, therefore, the counter palisade layer and hilar fissure come in direct contact with the outer environment. As in *Trifolium* and *Lupinus* (Hyde 1954), the hilar fissure of *D. lablab* does not usually break through the middle of the tracheid bar but extends laterally through the parenchymatous sheath.

According to Corner (1951) tracheid bar functions as a water reservoir during the development of seed and under adverse conditions it maintains turgidity of the embryo. But in mature seeds, the seed coat with palisade layer is impervious to gaseous exchange, thus the hilar fissure, provides passage for gaseous exchange through tracheid bar. However, Hyde (1954) believed that hilum obstructs entrance of moisture and permits continuous drying of the seed, and this helps in the development of hard seed condition.

Acknowledgements

Authors are thankful to Dr Nitya Anand, Ex-Director, Central Drug Research Institute, Lucknow, for permission to use the SEM and to Drs. A C Shipston and V K Bajpai for their help in the use of the instrument.

References

Corner E J H 1951 The Leguminous seeds, *Phytomorphology* **1** 117–150

—— 1976 in *The Seeds of Dicotyledons* Vols. 1 & 2 (Cambridge: Cambridge University Press)

Hyde E O C 1954 The function of the hilum in some Papilionaceae in relation to the ripening of the seed and the permeability of the testa; *Ann. Bot.* **18** (70) 241–256

Johanson D A 1940 *Plant Microtechnique* (London: Mc Graw-Hill Book Company, Inc.)

Netolitzky F 1926 *Anatomie der Angiospermen-Samen.*, (Berlin)

Sass J E 1964 *Botanical Microtechnique* (Oxford, Delhi : Oxford & IBH Publishing Co)