

Histological Examination of Seeds and Seed Coat Fragments in Cotton (*Gossypium hirsutum* L.).

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Introduction

Ginning of seed cotton separates the lint from the seed, by rupturing the fibers at their base. Due to varietal and environmental factors (Mangialardi and Lalor, 1990), fibers from the chalaza are sometimes torn off with a piece of seed instead of breaking. The seed coat fragments (SCFs) thus created, bearing fibers, cause numerous problems during spinning and dyeing (Pearson, 1939). Histological examinations were performed to determine their origin, to study their evolution during the spinning and to describe the differences between varieties in SCFs content of the lint.

Materials and methods

Examinations performed at the CIRAD/BIOTROP laboratory involve ten varieties of *Gossypium hirsutum* L., of various geographic origins and SCFs producing potentials. Seeds were examined by optical microscopy, after staining with Fasga (Tolivia and Tolivia, 1987) or scanning electron microscopy (SEM).

Results and discussion

In mature seeds, the coat is made up of six layers : external epidermis (ee) including fibre (f) producing cells, external mesophyll (em), internal epidermis (ie), palisade layer (pl), inner mesophyll (im) and fringe layer (fl).

The chalaza (figure 1) shows a very loose external mesophyll with several vessel bundles (vb), numerous stomata (s) and high fibers implantation density.

In raw fiber, SCFs (figure 2) are made up of the external epidermis with part of the external mesophyll and its vessel bundles.

During the spinning process, the card and the drawing frame remove practically all the mesophyll. The opening roller of rotor spinning machine breaks the largest SCFs into smaller fractions (figure 3) that remain together bound by their attached fibers.

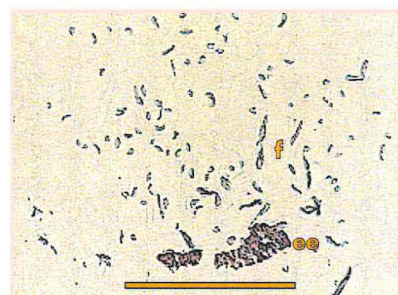


Figure 3.
Section through a SCF taken from the opening roller on the open end spinning. STAM variety. Bar = 450 µm.

Three key factors, observed at the chalaza, may be put forward to describe the inter-varietal differences noted as concerns SCFs production:

- the fiber foot constriction, within the epidermis, and width, beneath the epidermis,
- the stomata, constituting pre-cut lines of weakness at the surface of the epidermis,
- the compactness of the external mesophyll, much more high in a low SCFs production potential variety (figure 4) than in one with high potential (figure 5).

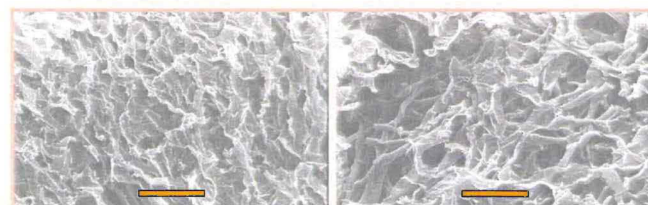


Figure 4.
External mesophyll, CS 189 variety with low SCFs production potential. SEM, bar = 50 µm.

Figure 5.
External mesophyll, ISA 784 D variety with high SCFs production potential. SEM, bar = 50 µm.

Conclusion

These factors are above all explanatory, but unsuited to lead a selection program against SCFs. Other tools, like image analysis (Gourlot et al., 1995), have therefore to be used by breeders.

References

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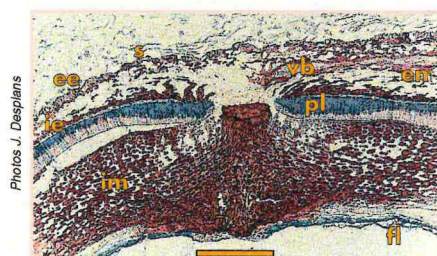
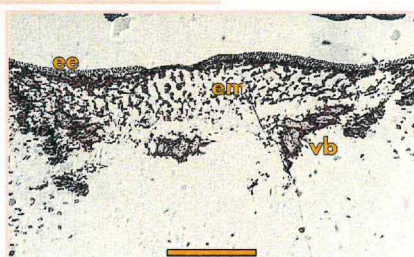


Figure 1.
Section through the chalaza. P288 variety. Bar = 450 µm.

Figure 2.
Section through a SCF taken from raw fiber. Pavlikeni variety. Bar = 450 µm.



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