

COMPARED ANATOMY OF COMMON BEAN POD GENOTYPES

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Along with the development of modern technologies applied to the bean crop and the need to enable mechanical harvest, it became important the development of bean cultivars presenting high yields, adequate architecture, high pod attachment, and resistance to shattering and lodging. To explain the dehiscence of the legume fruit, studies have been conducted on the basis of pericarp anatomy. There is a close relationship among the type of dehiscence, the fiber orientation, and the micelar structure of the cell walls.

With the objective to determine differences and identify bean genotypes bearing pods with morpho-anatomical characteristics capable of granting shattering resistance, trials were conducted at the National Research Center for Rice and Beans/EMBRAPA, using bean genotypes differing in plant architecture and pod characteristics, such as the cultivars Safira and Carioca and line RH7-33, sown between January and July/93 at greenhouse conditions. At anthesis, individual flowers were tagged and five pods were sampled at 5, 10, 15, 20, 25, and 30 days later. To evaluate the arrangement of the pericarp tissues and measure the area and degree of thickening on the endocarp sclerenchymatic fibers, anatomical cuts were performed on the valves and on the dorsal and ventral vascular bundles. The results obtained were subjected to analysis of variance and mean comparisons were performed using the Tukey test (5%).

Anatomically, in cross section, the pod pericarp is composed of three layers, exocarp, mesocarp and endocarp, formed by different tissues. The endocarp is composed of several layers of sclerenchymatic fibers in an oblique arrangement in relation to the pod longitudinal axis, forming an angle of approximately 45° and crossing the hypoderm elongated cells at 90° angle.

Analysing the area occupied by fibers and the thickening of the fibers in relation to the stage of pod development, increased growth was observed at 20 days after anthesis, differing from 15 and 25 but not from 30 days. Differences were also observed among the genotypes. At 30 days after anthesis, cultivar Safira presented the largest area and fiber thickening followed by RH7-33 and Carioca. Differences observed between Carioca and RH7-33 were negligible (Fig. 1).

The total area and the average thickening of the fibers in the vascular bundles performed differently, in which the dorsal bundle was consistently more developed and larger. In both bundles, dorsal and ventral, the three genotypes differed in relation to the fiber thickening. Variation was also observed for the area occupied by fibers in the ventral but not for the dorsal bundle (Table 1). Development of the sclerenchyma tissue related to fiber thickening in the valves and vascular bundles was similar for the three genotypes studied. Safira presented the thickest fibers followed by Carioca and RH7-33. Differences between Carioca and RH7-33, however, were not significant (Table 1).

The amount of fiber, expressed by the total area, was different among genotypes and pod structures evaluated. In the vascular bundles, either dorsal or ventral, the total area occupied by fiber was greater than in the valves; in the valves total area varied according to the genotype (Table 1).

Table 1. Average total area and thickening (cm²) of valves and vascular bundles of bean pods.

CULTIVAR/ LINE	VALVES		DORSAL BUNDLE		VENTRAL BUNDLE	
	ATF ¹	EMF ²	ATF	EMF	ATF	EMF
Safira	39.9 a	0.42 a	49.4 a	0.49 a	40.0 a	0.41 a
RH7-33	33.6 b	0.31 b	54.1 a	0.39 b	42.1 a	0.31 b
Carioca	27.3 c	0.35 b	52.0 a	0.44 ab	34.7 b	0.32 b

¹ Fiber total area (cm²)

² Average fiber thickening (cm²)

Means within columns not followed by the same letter are significantly different according to Tuckey at 0.05 level of probability

Results obtained for anatomical evaluations confirmed the morphological observations related to pod texture and dehiscence after harvest and demonstrated that there is variability among bean genotypes in the quantitative characteristics of the pod fibrous tissue. Cultivars with similar characteristics to those of RH7-33 and Carioca are more resistant to shattering than the ones similar to Safira. Reduced fiber content may reduce or delay pod dehiscence conferring to plants with this trait some advantages.

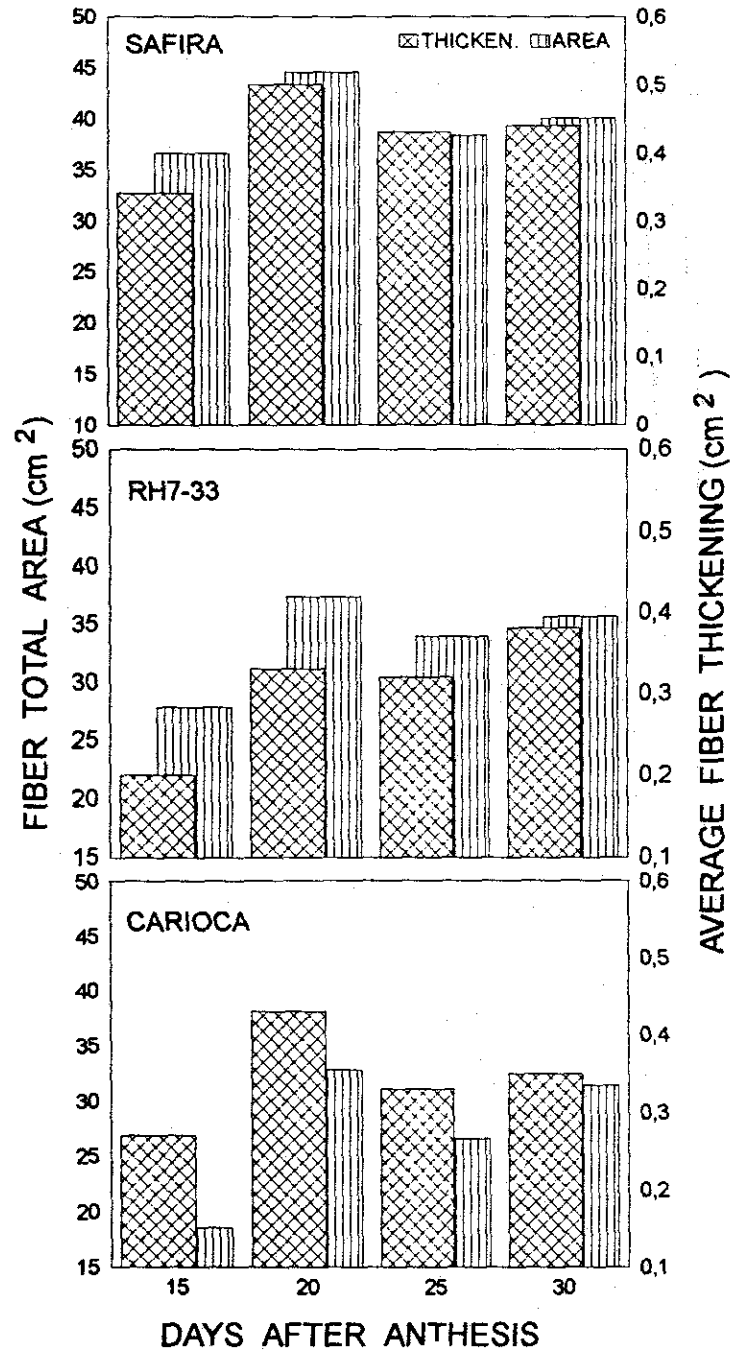


Fig. 1- Total area and fiber thickening (cm²) of valves of beans pods at various stages of development.