

YELLOW LEAF DISEASE OF ARECANUT : ANATOMICAL STUDIES

R. B. Nair

(Central Plantation Crops Research Institute Research Centre, Port Blair 744 101, Andamans)

INTRODUCTION

The first histopathologic studies were carried out by Nayar (1968). She observed in leaf tissues multinucleate cells, disturbed tissue differentiation and palisade cells blocked with dark brown pigments, as also chloroplasts in various stages of degeneration. Nair and Aravindakshan (1970) compared the anatomical features of healthy and diseased leaves and found that the diseased palms possessed smaller epidermal cells, stomatal structure, guard cells, stomatal pore and midrib parenchyma cells. On the other hand midrib xylem cells were larger in diseased palms. The stomatal index and life of stomata were also lower in the affected palms along with disarrangement of the contents of the epidermal cells and non turgidity of midrib phloem cells. About 35% of the xylem vessels were found to be blocked by tyloses. Only the older leaves of the affected palms were found to have these (Nair and Aravindakshan, 1970). Pillai (unpublished) has also confirmed this recently.

MATERIALS AND METHODS

Diseased samples were collected from affected trees of Palode, a diseased tract, and comparative healthy samples from disease-free palms of Palode and disease-free areas of Vellayani and Vittal. FAA was used as the fixative. Both free-hand sections and microtome preparations were employed. Studies on epidermal structures were based on peelings from the base, middle and tip portions of leaflets.

RESULTS AND DISCUSSION

Leaf. The thickness of cutinized layers of both surfaces of the lamina of healthy and diseased palms did not vary much. Epidermal cells from diseased palms were mostly devoid of cell contents and turgidity, and their nuclei were more deeply stained than those of healthy palms. The size of epidermal cells of diseased palms (628 sq μ) vary slightly smaller

than those of healthy palms (671 sq μ). Further, a slight reduction in overall development of the stomatal apparatus was seen in diseased palms. Also, a marginal increase in the number of epidermal cells was seen in diseased leaves along with a slight reduction in size. At the same time, the number of epidermal cells of the leaves of diseased palms was slightly more, but they were smaller in size. The stomatal index was lower in the diseased palms (10) as compared to healthy palms (12). The size of stomatal pore in healthy and diseased palms showed marked variation. Another characteristic was the more rapid collapse of stomata in diseased palms. These were irregular in shape with degenerated and deformed guard cells and shrunken stomatal pore. The stomatal pore was also seen to be plugged with some discoloured crystalline exudate. Such collapsed stomata did not take any stain and appeared yellowish. About 7% of stomata in diseased leaves showed such abnormalities. Comparisons of the vascular elements and other cells in the mid-rib of healthy and diseased palms did not show any consistent differences.

Another important difference observed in diseased leaves was the occurrence of tyloses in varying numbers (upto 9) in cross sections in xylem vessels. In early stages of the disease these appeared as tiny protrusions jutting into xylem vessels. Tyloses were formed by the invagination of the protoplast of the neighbouring parenchyma cells into the xylem lumen through pits. They undergo secondary thickening as evidenced by reticulate surface patterns. As the disease advances, they increase in number and size resulting in partial to complete blocking of the lumen of xylem vessels.

The phloem patches showed a significant increase in their areas in diseased palms (6237 sq μ) as compared to those in healthy palms (5104 sq μ). The size of phloem in such tissues also showed differences.

