STRUCTURE OF THE CELL WALL OF MANGO AFTER APPLICATION OF IONIZING RADIATION

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1. Introduction

■ The loss of firmness in fruits is usually attributed to major changes in cell wall composition as result, due mainly, of the activities of specific enzymes that catalyze reactions metabolic of degradation of protopectin of the middle lamella and primary cell wall of fruit. In mango *(Mangifera indica L.)*, the loss of pulp consistency is the result of solubilization of pectin by the action of polygalacturonase (PG), pectinametilesterase (PME), and cellulase (Chitarra and Chitarra, 2005; Singh and Dwivendi, 2008).

■ Irradiation is an effective post-harvest disinfestation method for many agricultural products and in recent years it has also been used as a means of delaying the ripening of fruit. For over half a century, efforts of many have demonstrated this is an effective, safe, and economical method for many countries to increase exports of their agricultural products. However, in some fruits such treatment has resulted in maintaining the firmness and in others it has found a less firmness and presence of browning in pulp, However, is necessary to determine the impact of irradiation on fruit quality including the microstructure of cells in order for this technology to be further adopted (Kume et al., 2009; Moy, 2005; Smith and Pillai, 2004)

2. Objective

The objective of this study was to analyze the structure of mango mesocarp cell walls with the use of TEM immediately after exposure of ionizing radiation and after simulated overseas transport and retail temperatures (20 days at 12 °C and 5 days at 21 °C).

3. Methodology

■ Mangoes (*Mangifera indica* L.) of cultivar Tommy Atkins produced in the Northeast of Brazil, were harvested with complete physiological development and irradiated with Cobalt-60 source at doses of 0.5 and 1.0 kGy in a radiator type 220 Gammcell Excel MDS Nordion, whose dose rate at the time of radiation was 7.065 kGy/h. The fruits were stored in a chamber at a temperature of 12 °C, followed by more five days in the storage room at a temperature of 21 ºC. Other four fingers of each dose were analyzed immediately.

■ For extraction and sample preparation two slices of the pulp (mesocarp), removal of the equatorial median portion of each side of the fruit, after cut into small rectangles (0.3 x 1.2 mm) were immersed in solution of 2.5% glutaraldehyde, 2% paraformaldehyde, buffered in sodium cacodylate 0.05 M, for 19 hours for fixation. Then, four washes were conducted with sodium cacodylate buffer 0.05 M, in which the discs remained 15 min. Then, the tissue was postfixed in osmium tetroxide 1% for 3 hours and then washed with four portions of distilled water, placed in uranyl acetate 2% during one night (Jacobi and Gowanlock (1995).

■ Analysis of cell wall was held at the Transmission Electron Microscope (TEM), Model Morgagni D268, produced by FEI, with a voltage of 80 kV and magnification between 4,500 and 11,000 times.

4. Results

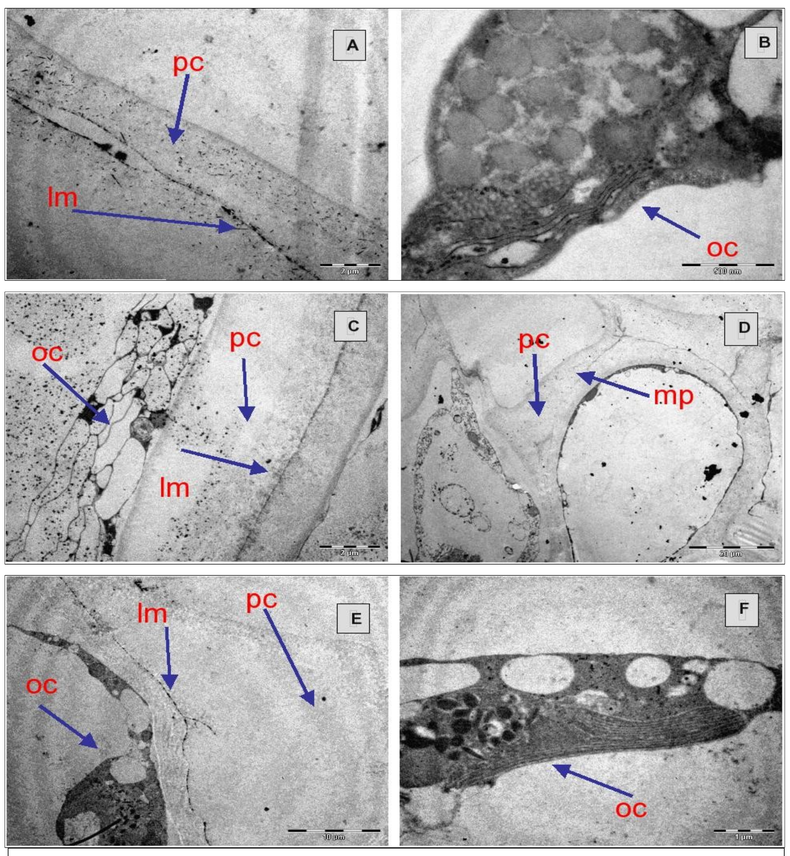

Fig. 1. *Electron micrograph images of mesocarp cells of Tommy Akins mango immediatel after irradiation. Legend: (A, B)= Non-irradiated fruits; (C, D)= Fruits with dose of 0.5 kGy; (E, F)= Fruits with dose of 1.0 kGy; cw= Cell wall; pm= Plasma membrane; ml= Middle lamella; co= Cellular organelles. Bars: (A, C)= 2 µm; (B)= 500 µm; (D)= 20 µm; (E)= 10 µm; (F)= 1 µm.*

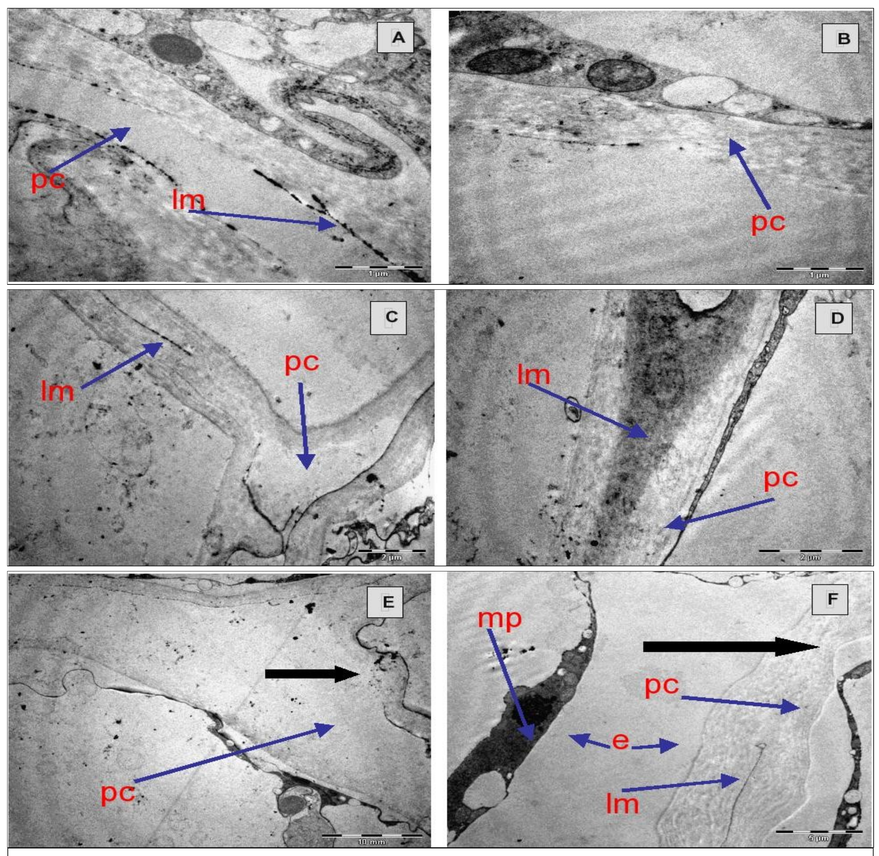

Fig. 2. *Electron micrograph images of mesocarp cells of Tommy Akins mango after twenty days at a temperature of 12 °C, followed by five days of simulated marketing at a temperature of 21 °C. Legend: (A, B)= Non-irradiated fruits; (C, D)= Fruit with dose of 0.5 kGy; (E, F)= Fruit with dose of 1.0 kGy. cw= Cell wall; pm= Plasma membrane; ml= Middle lamella; co= Cellular organelles. Arrow thicker= Cell wall irregular. Bars: (A, B)= 1 µm; (C, D)= 2 µm; (E)= 10 µm; (F)= 5 µm.*

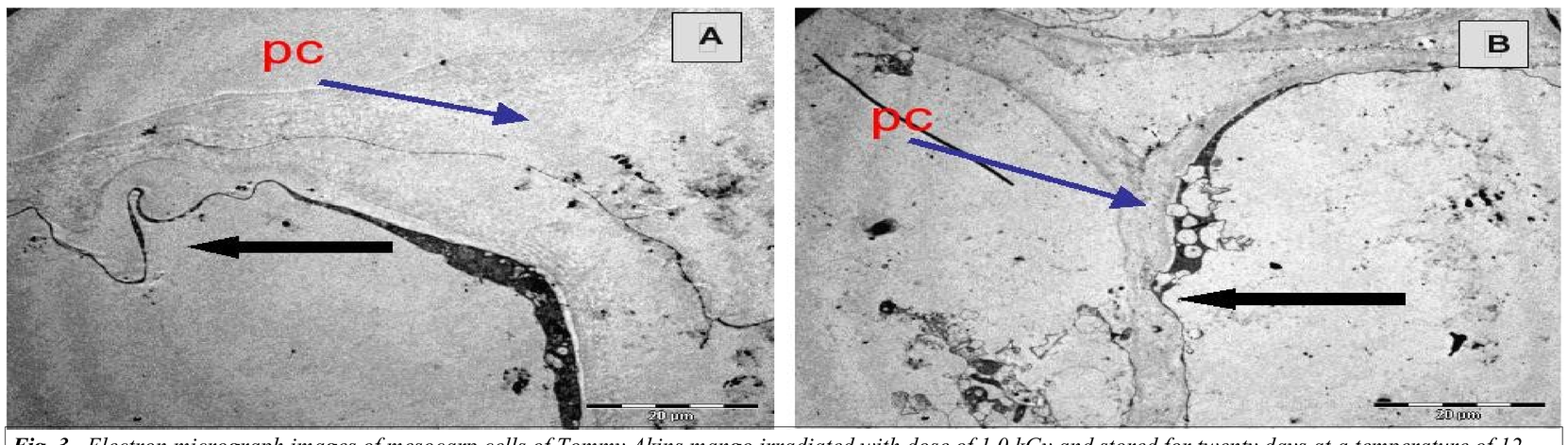

Fig. 3. *Electron micrograph images of mesocarp cells of Tommy Akins mango irradiated with dose of 1.0 kGy and stored for twenty days at a temperature of 12 °C, followed by five days of simulated marketing at a temperature of 21 °C. Legend: A= Cell walls folding; B= Cell wall thin (thicker arrow); cw= Cell wall. Bars: (A, B)=20 µm.*

5. Conclusions

■ *Cells of the mesocarp of the mango cultivar Tomy Atkins showed no changes in the structure of the cell wall, middle lamella and the plasma membrane immediately after application of ionizing radiation at doses of 0.5 and 1.0 kGy;*

■ *After twenty days at a temperature of 12 ºC, followed by another five days at a temperature of 21 °C changes were observed in the structure of the cell wall, middle lamella and the plasma membrane of all fruits, with smaller changes in fruit irradiated with a dose of 0.5 kGy and greater changes in irradiated fruit dose of 1.0 kGy;*

■ *These results will serve postharvest physiology research specializing in the study of cell wall structure of irradiated fruits. Unwanted change in the texture of the fruit and reduces its consumption and constitutes a barrier to a trade larger fruit irradiated. The work done in this area should seek to determine the best dose to achieve the desired goals without causing changes in fruit quality.*

6. References

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7. Acknowdegments

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