Title	Changes in watermelon chromoplasts and other mesocarp cellular ultrastructures as a function of melon maturity
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Abstract

Watermelon, a natural source of the antioxidant lycopene (~48.7 mg/g) could be a useful ingredient in functional foods. An understanding of the structure of watermelon chromoplasts (lycopene-containing organelles), along with other cellular structures, is critical to correlate melon maturity with maximum lycopene content and extraction efficiency. This is essential for the economical creation of high-lycopene extracts and concentrates from watermelon and thus watermelon based functional foods. This study employed Transmission Electron Microscopy (TEM) to conduct research on the ultrastructure of watermelon mesocarp. Our goal was to elucidate possible changes in the organization of chromoplasts and other cellular components at key stages in melon maturity. Watermelon samples (cultivar: HAZARA SW-1) of different maturities: "immature", "mature", and "over mature" stages were collected from research plots and core samples from each fruit were fixed with glutaldehyde and osmium tetroxide, dehydrated, infiltrated with phosphate buffer, and then sectioned for ultrastructure studies. TEM micrographs showing lycopene-bearing chromoplasts, along with other major structural organelles, were prepared. Micrographs from "immature" melons showed incompletely formed chromoplasts. A combination of clear and distinct pigment bearing chromoplasts and some incompletely formed chromoplasts were observed in "mature" melon micrographs. Growth-related organelles were also observed in both "immature" and "mature" but not in "over mature" melons. Electron micrographs showed chromoplast changing from a definite, symmetrical form in "immature" to a less organized, asymmetrical structure in "over mature" melons, likely as a function of maturity. Results of this study will further our understanding of watermelon physiology and the effect of maturity on compartmentalization of lycopene in the fruit. Future studies will relate observed changes in watermelon cellular ultrastructure to processing techniques and lycopene recovery.