Title Morphological and physiological traits of spongy disordered tissues in Mango (*Mangifera Indica* L.) fruit

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Abstract

Spongy tissue disorder in mango fruit is characterized by the formation of spongy-like white tissue in the fruit pulp. Diagnosis of the spongy tissue disorder based on the external appearance is difficult even at the picking and/or ripening stage because the disorder often develops primarily in the pulp adhered to the seed. Although the mechanism of spongy tissue disorder is not yet clear, activities of some enzymes such as superoxide dismutase, catalase, polyphenol oxidase, peroxidase, and amylase and/or the concentrations of some nutrients such as K, P, and Ca in spongy tissues are often lower than those in normal tissue. Studies of spongy tissue disorder in mango fruit have mainly been approached from the aspect of a physiological mechanism, while few morphological studies have been conducted. In this study, matured 'Nam Doc Mai See Thong' mango fruits were harvested in June 2011 from orchards of Chiang Mai, Thailand, dipped in 500 ppm 2-chloroethylphosphonic acid solution for 5 min., kept for 3 days at 25°C, stored for 35 days at 5°C, then kept for 7 days at 25°C again. Tissues for microscopic observation were taken from both spongy disordered and normally ripened parts of the same fruit and used for determining the morphological characteristics of spongy as compared with normal tissue. SEM images showed that spongy tissue was characterized by a wavy structure. Numerous small grains of approximately 10 μm in diameter were also observed in the cross-section of spongy cells, while only a few grains were observed in the normal cells. Optical microscopic images of sections dyed with iodine solution suggested that the conversion of starch into soluble sugars was inhibited in the spongy tissues. Analysis employing an energy dispersive X-ray analyzer showed that the distribution of calcium ions on the surface of spongy tissues tended to be lower than that of normal tissues even in the same fruit, suggesting that the mal-distribution of calcium within a fruit might be a factor for leading to the development of spongy tissues.