

ELECTRON BEAM TECHNOLOGY FOR PRESERVING QUALITY ATTRIBUTES OF MANDARINS FOR ENHANCING EXPORT POTENTIAL

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There is a need for countries around the world to increase their exports of agricultural products. The export of agricultural products adds significantly to the economic development of a country. Agricultural exports such as mandarin oranges and other citrus fruits are of high commercial value especially tropical fruits are gaining in popularity around the world. However, to deal with strict transboundary phytosanitary requirements, these commodities have to be appropriately treated. Ionizing technologies such as gamma, electron beam (eBeam) and X-ray are suitable technologies. The focus of this study was to determine whether the accelerator technology, namely eBeam technology can be combined with cold temperature storage technology to preserve the quality of mandarins. The science question we were pursuing was whether cold storage before or after eBeam processing was the most beneficial to preserve mandarin quality. The study was performed with mandarins harvested in two different locations: one in California and the other in Chile. There were three different eBeam dose treatments namely, 0 Gy (un-treated), 50 Gy, and 150 Gy. The cold temperature+ eBeam combination treatments were as follows: 50 Gy + 3 days storage at 1°C, and 50 Gy + 5 days at 1°C. Additionally, two more experimental treatments were included namely 3 or 5 days of storage at 1°C prior to eBeam processing at 50 Gy. After these combination treatments, the fruit were stored for three weeks; 14 days at 7°C and one week at room temperature. The quality attributes from these combination treatments were evaluated based on standard methods normally utilized for evaluating the quality of fruit in commercial trade namely Citrus Color Index (CCI), maturity index, weight loss, extractable juice volume, pH, vitamin C, and overall appearance. Overall, the results indicate that the observable differences in these quality parameters were attributable to geographical origin of the mandarins and their stage maturity, rather than the eBeam + cold storage combination treatments. The study highlighted that 150 Gy was detrimental to the fruit quality. These results demonstrate the potential for a new phytosanitary treatment of mandarins which would be 50 Gy, followed by refrigerated storage for 3 days at 1°C. These results suggest that eBeam technology can be technologically compatible with citrus fruits. What is needed are economic and technical feasibility analyses to build and operate purpose built accelerator facilities in citrus growing regions of the world.