# NON-DESTRUCTIVE MEASUREMENT TO PREDICT QUALITY AND THE USE OF PLASMA FINE BUBBLES FOR EXTENDING THE SHELF LIFE OF FRUITS

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Postharvest handling is a critical process in fruit production, as it directly impacts produce quality, safety, shelf life, and losses. Recent advancements in Portable Near Infrared (NIR) Spectroscopy and non-thermal technology/ chemical-free in postharvest processes, such as Plasma Fine Bubbles, offer innovative solutions for enhancing postharvest handling. Portable NIR spectroscopy provides a rapid, non-destructive technique for assessing fruit quality parameters such as moisture content, sugar levels, and firmness. Its portability allows for real-time monitoring during harvesting, grading, storage, and transportation, offering a more efficient way to ensure fruits meet market standards. This method provides robust and real-time quality prediction with more than 90 percent accuracy. Plasma Fine Bubbles, created by exposing water to plasma discharge, is emerging as an effective antimicrobial agent due to its rich composition of reactive oxygen and nitrogen species (RONS). The laboratory test indicated that the water exposed by plasma through the Fine Bubbles generator for 30 minutes resulted in hydroxyl radicals such as O3, H2O2, H, O, etc. This technology has the potency to be applied in fruit washing to reduce microbial contamination without harmful chemicals, thereby extending shelf life and preserving fruit quality.

Keywords: plasma; fine bubble; activated water; postharvest handling; portable near-infrared spectroscopy