

Chlorophyll fluorescence, non-photochemical quenching and light harvesting complex as alternatives to color measurement, in classifying tomato fruit according to their maturity stage at harvest and in monitoring postharvest ripening during storage

Dimitrios S. Kasampalis, Pavlos Tsouvaltzis and Anastasios S. Siomos

Postharvest Biology and Technology, Volume 161, March 2020, 111036

Abstract

Tomato fruit classification and postharvest ripening monitoring based on maturity stage of fruit at the time of harvest are necessary, in order to guarantee the highest possible quality and marketability of the final ripe product. The aim of this study was to investigate if three non-destructive innovative and convenient protocols, in terms of rapidness, accuracy and expense, can be exploited in the discrimination of the maturity stage of tomato fruit and in the assessment of the pericarp's pigments content, as well as in the monitoring of the postharvest ripening of tomato fruit during storage. These protocols included the measurement chlorophyll fluorescence (OJIP), the non-photochemical quenching of photosystem (NPQ) and the light harvesting complex (LHC). The efficiency of these methods was compared to that of the colorimeter, which is widely used for such purpose. According to the results, specific parameters of all the three protocols can classify the tomato fruit according to their maturity stage, as efficiently as the hue angle parameter of the color measurements. Additionally, certain parameters of these protocols were identified that can monitor the tomato fruit ripening during storage more reliably even compared to the colorimeter parameters, while also being strongly correlated with the tomato fruit pericarp pigments' content. Among the three protocols, the OJIP is the most accurate one which also excels in generating data faster than the rest. Moreover, the 'fix area' parameter of the OJIP protocol retains the efficiency to discriminate fruit during 16 days of storage according to their initial ripening stage at harvest, even when all tomatoes turn red, in contrast to hue angle parameter, which was less efficient in distinguishing the different initial maturity stages, beyond the 8th day of storage. Models based on 'fix area' parameter better reflect the actual ripening process of fruit per maturity stage than the ones based on hue angle data.