

# Ripeness indexes and physicochemical changes of papaya (*Carica papaya* L. cv. Maradol) during ripening on-tree

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Scientia Horticulturae 236: 272-278. (2018)

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## Abstract

The degree of ripeness of fruits is a determining factor for consumption, marketing, and minimal processing. The aim of this study was to establish ripeness stages of papaya (*Carica papaya* L. cv. Maradol) by describing the physicochemical changes and the relationships between different ripeness indexes during ripening stages on-tree (RST). Papayas from physiological (RST1) to consumption (RST5) ripeness, with three intermediate (RST2, RST3 and RST4) stages, and over-ripe fruits (ORF) were selected by visual color perception and days after anthesis. Physicochemical changes such as epicarp color, total soluble solids (TSS), mesocarp firmness (MF), moisture content, pH, and titratable acidity (TA) and sugar-acid ratio were determined. Multiple comparisons between stages were performed and the significance were determined by Tukey test ( $p \leq 0.05$ ). The relationship between color parameters, TSS, and MF was determined by Pearson correlation coefficient from RST1 to RST5. Parameters as  $L^*$ ,  $a^*$ ,  $b^*$ ,  $C^*$ , and TSS values linearly increased during ripening; conversely,  $h^\circ$  decreased as a result of color change from green to orange-red. Mesocarp firmness non-linearly decreased due to gradual softening of fruit tissues, it was higher at early stages and similar between later stages. Additionally, pH and TA values increased when ripening was developed. Fruits showed no significant changes ( $p \leq 0.05$ ) in moisture content indicating continuous water supply while fruits were still on-trees. TSS content and MF can be calculated (high  $R^2$  coefficient) by considering maximum and minimum  $h^\circ$  values in each RST. The high correlation showed between ripeness indexes allowed to establish model equations for destructive tests values such as TSS and MF with nondestructive test such as CIEL\*a\*b\* and CIEL\*C\*h° scales. Papayas on tree can be selected and harvested with quantitative parameters at desired ripeness while the ripening process elapses.