Title Image Processing Applied to Classification of Avocado Variety Hass (*Persea americana* Mill.) During the Ripening Process

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Abstract

This work was undertaken to analyze the ripening process of avocados variety Hass (*Persea americana* Mill.) by image processing (IP) methodology. A set of avocados (10 samples) was used to follow the changes in image features during ripening by applying a computer vision system, extracting color and textural parameters. Other 16 avocados were used to evaluate the firmness and mass loss. Three maturity stages of avocados were established, and a classification was obtained by applying principal component analysis and *k*-nearest neighbor algorithm. During the ripening process (12 days), avocado firmness decreased from 75.43 to 2.63 N, while skin color values kept invariable during 6 days; after that, a decrement in the peel green color (*a**) was observed (−9.68 to 2.32). Image features showed that during ripening the color parameters (*L**, *a**, and *b**), entropy (4.29 to 4.00), angular second moment (0.287 to 0.360), and fractal dimension (2.58 to 2.44) had a similar path as compared to mass loss, *a**, and firmness ripening parameters, respectively. Relationships between image features and ripening parameters were obtained. The parameter *a** was the most useful digital feature to establish an acceptable percentage of avocado classification (>80%) in three different maturity stages found. Results obtained by means of IP could be useful to evaluate, at laboratory level, the ripening process of the avocados.

http://www.springerlink.com/content/w8321878j8544602/fulltext.pdf