

ABSTRACT

THERMAL IMAGE METHOD AS A DETECTOR OF VARIOUS LEVELS OF FRUIT MATURITY AND ITS CORRELATION WITH THE PHYSICAL AND CHEMICAL QUALITY OF AVOCADO FRUIT (*Persea americana* Mill.)

By

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Avocado belongs to the group of climacteric fruits and it is perishable in nature after harvest. This study aims to analyze various levels of maturity of avocado fruit with the thermal image method, obtain a correlation between the result of thermal image feature extraction and various levels of maturity on the physical and chemical quality of avocado fruit and test the thermal image as a detector avocado fruit maturity level. Avocado samples were based on five levels of maturity, from less mature to most mature fruit, with five experiment replications. Thermal image parameters were determined and then correlated to the physical quality parameters of the fruit, including: diameter, weight, and fruit firmness as well as to the chemical quality parameters of the fruit, including: fat content, starch, free acid, glucose, sucrose and total soluble solids. Furthermore, the data were statistically analyzed using Completely Randomized Design (CRD) and the Least Significant Difference (LSD) test. The results showed that maturity of fruit had a correlation to the temperature of fruit. The more mature the fruits the lower the temperature, but when the fruit was getting ripe, the more mature of the fruits, would show a higher temperature compared to the immature fruits. The statistical analysis stated that there was a close correlation between temperature and the physical and some chemical parameters. The coefficients of determination was found to be 0.79, 0.71, 0.75, 0.05, 0.20, 0.46, 0.71, 0.02, 0.58 and 0.24 for diameter, weight, firmness, glucose, sucrose, starch, free acid, free fatty acid, fat, total soluble solids and of the avocado fruits, respectively. The relationship between thermal radiation and the physical parameters fruit (diameter, weight, hardness) and chemical parameters (glucose, sucrose, starch, free acids, free fatty acids, fat and total soluble solids) followed a linear equation relationship at different levels of maturity, SEM profile results are also related to maturity level. Thus, it can be stated that the fruit temperature radiation represented by the thermal image had the opportunity to be used as a method of detecting the level of maturity in avocados.

Keywords: temperature, maturity, thermal image, SEM, quality

ABSTRAK

***THERMAL IMAGE METHOD* SEBAGAI PENDETEKSI BERBAGAI TINGKAT KEMATANGAN BUAH DAN KORELASINYA DENGAN MUTU FISIK DAN KIMIA BUAH ALPUKAT (*Persea americana* Mill.)**

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Alpukat termasuk dalam kelompok buah klimakterik dan sifatnya mudah rusak setelah dipanen. Penelitian ini bertujuan untuk menganalisis berbagai tingkat kematangan buah dengan metode *thermal image*, memperoleh korelasi hasil ekstraksi fitur *thermal image* dan berbagai tingkat kematangan buah terhadap mutu fisik dan kimia buah alpukat dan menguji metode *thermal image* sebagai pendeteksi tingkat kematangan buah alpukat. Sampel buah alpukat berdasarkan lima tingkat kematangan, dari buah termuda sampai tertua, dengan lima ulangan percobaan. Parameter citra termal diukur kemudian dikorelasikan dengan parameter kualitas fisik buah, meliputi: diameter, berat, dan kekerasan buah serta kualitas kimia buah, meliputi: kadar lemak, pati, asam bebas, glukosa, sukrosa dan total padatan terlarut diukur. Selanjutnya data dianalisis secara statistik menggunakan Rancangan Acak Lengkap (RAL) dan uji Beda Nyata Terkecil (BNT). Hasil penelitian menunjukkan bahwa buah tua memiliki suhu yang lebih rendah daripada buah muda, namun saat buah mulai masak, suhu buah yang tua lebih tinggi daripada buah yang muda. Hasil analisis statistik menyatakan bahwa terdapat hubungan yang erat antara parameter citra termal dengan parameter fisik dan beberapa parameter kimia. Koefisien determinasi masing-masing yang diperoleh 0.79, 0.71, 0.75, 0.05, 0.20, 0.46, 0.71, 0.02, 0.58 dan 0.24 untuk diameter, berat, kekerasan, glukosa, sukrosa, pati, asam bebas, asam lemak bebas, lemak dan total padatan terlarut dari buah alpukat. Hubungan radiasi termal, parameter fisik (diameter, berat, kekerasan buah) dan parameter kimia (glukosa, sukrosa, pati, asam bebas, asam lemak bebas, lemak dan total padatan terlarut) mengikuti hubungan persamaan linier pada tingkat kematangan yang berbeda, hasil profil SEM juga berkaitan dengan tingkat kematangan. Dengan demikian, dapat dinyatakan bahwa radiasi suhu obyek buah yang diwakili oleh citra termal buah berpeluang untuk digunakan sebagai metode pendeteksian tingkat kematangan pada buah alpukat.

Kata kunci: suhu, kematangan, *thermal image*, SEM, mutu