

## EVALUASI KUALITAS BERBASIS X-RAY COMPUTED TOMOGRAPHY DAN SIMULASI PERPINDAHAN PANAS BUAH NAGA DENGAN GEOMETRI AKTUAL 3-D PADA PENYIMPANAN ACTIVE MODIFIED ATMOSPHERE PACKAGING

### INTISARI

Oleh:

**CINTIA DWIYANA NOVA**  
**20/463625/TP/12903**

Evaluasi kualitas produk pertanian secara non-destruktif kini banyak dikembangkan mengingat keunggulannya dalam melakukan analisis tanpa merusak produk. Evaluasi non-destruktif dengan X-Ray CT menjadi metode yang ideal untuk menganalisis kualitas fisik buah naga yang disimpan dengan metode *Active Modified Atmosphere Packaging* (a-MAP). Penanganan pascapanen buah naga dimulai dari pembersihan, sortasi, grading, pelabelan dan pengemasan. Setelah itu buah naga disimpan di *cold storage* pada suhu rendah 8°C. Buah naga pada penyimpanan dingin dibedakan menjadi 3 perlakuan penyimpanan yaitu a-MAP 23 *oxygen absorbent*, a-MAP 46 *oxygen absorbent* dan kontrol (tanpa a-MAP). Penelitian ini bertujuan untuk melakukan evaluasi kualitas buah naga sebelum dan setelah penyimpanan melalui hasil rekonstruksi gambar 3-D berbasis X-Ray CT dan melihat bagaimana perpindahan suhu rendah yang diaplikasikan pada penyimpanan buah naga. Hasil evaluasi non-destruktif berbasis X-Ray CT menunjukkan buah naga pada penyimpanan a-MAP lebih mampu mempertahankan kualitas buah naga daripada perlakuan kontrol pada parameter perubahan ukuran dan bentuk buah serta beberapa parameter pendukung (uji destruktif) seperti susut bobot, warna, kekerasan, TPT, dan pH. Untuk perpindahan suhu diketahui melalui pembuatan simulasi transient menggunakan *Computational Fluid Dynamics* (CFD) dan diperoleh informasi bahwa buah naga yang disimpan pada suhu rendah 8°C membutuhkan waktu 686 menit (11 jam 26 menit) untuk menyebarkan suhu dingin 8°C secara merata ke seluruh bagian buah. Hal ini dipengaruhi oleh perbedaan gradien suhu dan perpindahan panas. Beberapa hasil penelitian ini akan menjadi *quality control* yang baik serta membantu mengevaluasi kualitas buah naga khususnya produk buah naga ekspor yang menuntut kualitas produk yang terbaik.

**Kata kunci :** *Active Modified Atmosphere Packaging*, evaluasi kualitas, non-destruktif, X-Ray CT, *Computational Fluid Dynamics*

**QUALITY EVALUATION BASED ON X-RAY COMPUTED  
TOMOGRAPHY AND SIMULATION OF DRAGON FRUIT HEAT  
TRANSFER WITH 3-D ACTUAL GEOMETRY IN ACTIVE MODIFIED  
ATMOSPHERE PACKAGING STORAGE**

**ABSTRACT**

**By:**  
**CINTIA DWIYANA NOVA**  
**20/463625/TP/12903**

Quality evaluation of agricultural products using non-destructive methods has been widely developed considering its advantages in analyzing products without any damage. Non-destructive evaluation based on X-Ray CT is an ideal method for analyzing the physical quality of dragon fruit stored using the Active Modified Atmosphere Packaging (a-MAP) method. Post-harvest handling of dragon fruit starts from cleaning, sorting, grading, labeling and packaging. After that the dragon fruit is stored in cold storage at a low temperature of 8°C. Dragon fruit in cold storage is divided into 3 storage treatments: a-MAP 23 oxygen absorbent, a-MAP 46 oxygen absorbent and control (without a-MAP). This research aims to evaluate the quality of dragon fruit before and after storage through the results of 3-D image reconstruction based on X-Ray CT and how low temperature transfer is applied to dragon fruit storage. The results of the non-destructive evaluation based on X-Ray CT showed that dragon fruit in a-MAP storage was better able to maintain the quality of dragon fruit than the control treatment in the parameters of changes in fruit size and shape as well as several supporting parameters (destructive tests) such as weight loss, color, hardness, TPT, and pH. The temperature transfer was determined by creating a transient simulation using Computational Fluid Dynamics (CFD) and information was obtained that dragon fruit stored at a low temperature of 8°C needed 686 minutes (11 hours 26 minutes) for the cold temperature of 8°C to reach the center of the fruit (distribution in all parts). This is influenced by differences in temperature gradients and heat transfer. Some of the results of this research will provide good quality control and help evaluate the quality of dragon fruit, especially export dragon fruit products which demand the best product quality.

**Keywords :** Active Modified Atmosphere Packaging, quality evaluation, non-destructive, X-Ray CT, Computational Fluid Dynamics