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Determination of thermal diffusivity of persimmon flesh tissue using three-dimensional structure model based on X-ray computed tomography

Fumihiko Tanaka, Keitaro Imamura, Fumina Tanaka, Toshitaka Uchino



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4 Fumihiko Tanaka<sup>a,\*</sup>, Keitaro Imamura<sup>b</sup>, Fumina Tanaka<sup>a</sup>, Toshitaka Uchino<sup>a</sup>

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6 <sup>a</sup> Laboratory of Postharvest Science, Faculty of Agriculture, Kyushu University, 6-10-1,  
7 Hakozaki, Higashi-ku, Fukuoka 812-8581, Japan

8 <sup>b</sup> Graduate school of Bioresource and Bioenvironmental Sciences, Kyushu University, 6-10-1,  
9 Hakozaki, Higashi-ku, Fukuoka 812-8581, Japan

10 Corresponding author: Fumihiko Tanaka

11 E-mail: fumit@bpes.kyushu-u.ac.jp

12 Tel & Fax: +81-92-642-2935

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#### 14 **Abstract**

15 Computed tomography (CT) images were acquired for an intact fruit and the cell tissues of  
16 persimmon flesh using two types of X-ray CT devices. The relationship between the porosity  
17 and mean CT value for small tissue samples having a volume of 0.3 mm x 0.3 mm x 0.3 mm  
18 was investigated. The three-dimensional microstructure of the issue was reconstructed using  
19 image processing software and heat transfer simulation was carried out based on the real  
20 structure model. The effective thermal conductivity of the tissue was determined by comparing  
21 the results of the three-dimensional (3D) model simulation with those of the homogeneous  
22 model simulation and was related to the porosity of the sample. The Brailsford model was  
23 selected as the most suitable model to predict the effective thermal conductivity of the tissue.  
24 The porosity, thermal conductivity and moisture distributions were visualized for an intact fruit  
25 based on analysis of high-resolution X-ray image.

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