INTISARI

DETEKSI DAGING MERAH SAPI BERFORMALIN MENGGUNAKAN SISTEM CITRA FOTOAKUSTIK BERBASIS LASER 532 nm

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Telah dilakukan penelitian tentang aplikasi fotoakustik berbasis laser 532 nm untuk mendapatkan citra daging sapi tanpa formalin dan berformalin. Penelitian ini dilatarbelakangi oleh salah satu bentuk penyalahgunaan pengolahan daging sapi untuk memperoleh keuntungan adalah penggunaan bahan berbahaya yaitu formalin. Oleh karena itu dilakukan penelitian tentang karakterisasi daging sapi melalui metode pencitraan fotoakustik menggunakan laser 532 nm. Aplikasi penelitian ini diharapkan dapat membedakan citra daging sapi tanpa formalin dan berformalin. Tujuan lainnya adalah menentukan hubungan intensitas bunyi rata-rata terhadap konsentrasi, perbedaan citra tomografi fotoakustik daging sapi berformalin dengan variasi konsentrasi formalin. Variasi konsentrasi larutan formalin yang digunakan yakni, 0%, 5%, 10%, 15%, dan 20% serta durasi perendaman dilakukan secara *real time*. Hasil yang diperoleh dari penelitian ini berupa modulasi laser dengan frekuensi optimum 18.000 Hz, *duty cycle* optimum 30, dan citra fotoakustik dari daging sapi tanpa formalin dan daging sapi mengandung formalin menggunakan sistem fotoakustik laser dioda 532 nm dengan taraf intensitas untuk tiap sampel 0%, 5%, 10%, 15% dan 20% sebesar -90,44 dB, -90,19 dB, -89,57 dB, -89,50 dB dan -89,34 dB. Bertambahnya nilai konsentrasi perendaman formalin mengakibatkan adanya kenaikan taraf intensitas citra akustik. Hasil analisis histogram, *plot profile,* dan *surface plot* menunjukkan perbedaan intensitas *gray level* citra daging sapi tanpa formalin dan daging sapi berformalin melalui citra derajat keabuan, sehingga pencitraan sistem fotoakustik mampu membedakan daging sapi tanpa formalin dan daging sapi berformalin.

Kata kunci : citra fotoakustik, laser 532 nm, daging sapi, formalin.

ABSTRACT

DETECTION OF FORMALIN BEEF RED MEAT USING A 532 NM LASER-BASED PHOTOACOUSTIC IMAGING SYSTEM

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Research has been conducted on the application of 532 nm laser-based photoacoustics to obtain images of beef without formalin and formaldehyde. This research was motivated by one form of abuse of beef processing to obtain profits is the use of harmful materials, namely formalin. Therefore, research was conducted on the characterization of beef through photoacoustic imaging methods using a 532 nm laser. The application of this research is expected to distinguish the image of beef without formalin and formalin. Another objective is to determine the relationship between average sound intensity to concentration, and differences in photoacoustic tomography images of formalin beef with variations in formalin concentration. Variations in the concentration of formalin solution used, namely 0%, 5%, 10%, 15%, and 20%, and the duration of soaking is carried out in real-time. The results obtained from this study were laser modulation with an optimum frequency of 18,000 Hz, an optimum duty cycle of 30, and photoacoustic images of beef without formalin and beef containing formalin using a 532 nm diode laser photoacoustic system with intensity levels for each sample of 0%, 5%, 10%, 15% and 20% of -90.44 dB, -90.19 dB, -89.57 dB, -89.50 dB, and -89.34 dB. The increase in the concentration value of formalin immersion results in an increase in the level of acoustic image intensity. The results of a histogram, plot profile, and surface plot analysis showed differences in the intensity of gray-level images of beef without formalin and formalin beef through grayish images, so that the photoacoustic imaging system can distinguish beef without formalin and beef without formalin.

Keywords: photoacoustic imaging, 532 nm laser, beef, formalin.