

## Quality Inspection of Potatoes by Laser Light Backscattering Imaging and Validating the Technique with HPLC

Saeedeh BABAZADEH\*, Parviz Ahmadi MOGHADDAM, Arash SABATYAN, Faroogh SHARIFIAN

Urmia University, Iran

\*: Corresponding author

**Abstract:** Objective: Potato is one of the most important food crops of the world which provides essential nutrients, mainly carbohydrate. Despite nutrients, toxic components may occur in potato tubers during growth and postharvest period and reduce their quality. The main part of these toxic compounds called glycoalkaloids. Materials & Methods: Herein, we propose a laser light-based non-destructive technique to recognize only  $\alpha$ -solanine toxicant in potatoes. The setup of laser application is composed of a polarized laser at the wavelength of 635 nm, two polarized filters, beam splitter, and potato holder. The beam (size of 2 mm) was projected to different parts of potatoes, vertically. High-performance liquid chromatography (HPLC) analysis is also performed as a destructive and reference test to verify the laser light backscattering imaging (LLBI) technique. The single layer perceptron neural networks have been used to classify healthy and toxic potatoes from each other using features such as backscattering area, the amplitude, and half-width coefficients of red color component in Gaussian functions of the backscattering regions. Results: The results demonstrated that artificial neural networks (ANNs) classified potatoes of cv. 'Donald' and 'Ceasar' with the accuracy of 98.66% and 99.16% and mean square errors (MSE) of 0.013 and 0.003, respectively. In addition, it was seen that backscattering area for healthy potatoes is about twice greater than it for toxic potatoes. Conclusions: It can be concluded that LLBI systems may take precedent over other imaging systems such as hyper-spectral imaging due to their industrialization, high accuracy and rapidity in sorting of potatoes.

**Keywords:** Potato, Gaussian Function, Laser Backscattering Imaging, Glycoalkaloids, High Performance Liquid Chromatography