Poster

Optical imaging to design convolutional systems to ensure quality and safety food

Beck Díaz, Irene (1); Pradana-López, Sandra (2); Pérez-Calabuig, Ana M. (2); Moral Rama, Ana (1); Torrecilla Velasco, José S. (2)*

(1)Departamento de Biología Molecular e Ingeniería Bioquímica, Universidad Pablo de Olavide, Carretera de Utrera Km 1, 41013 Sevilla, España

(2)Departamento de Ingeniería Química y de Materiales, Universidad Complutense de Madrid, 28040, Madrid, Spain

Tutor académico: Moral Rama, Ana

Keywords: Food quality control, saffron adulteration, convolutional neural network, UV–visible spectroscopy, Attenuated Total Reflection

ABSTRACT

Food adulteration is a universal concern that seriously affects food quality and safety throughout the world. Fundamentally, this activity pursues economic benefit. Therefore, the foods that suffer the most from this type of activity are those with a higher selling price.

Among the most vulnerable food products is saffron. This spice is produced from the dried stigmas of the Crocus sativus L. flower, and is considered one of the most expensive spices in the world. Its sale price is conditioned by the labor required and its limited production (Li et al., 2020).

As a spice, saffron is a product widely used in cooking as a coloring and flavoring in food. In addition, it is used in traditional medicine, for its beneficial effects on health. In order to reduce the cost of this spice, and thus achieve greater economic benefit, a variety of substandard and fraudulent products have appeared. These products are based on the replacement of saffron by plant materials with a similar appearance.

Until now, analytical techniques, such as chromatography, and spectroscopic techniques have been developed to detect adulteration of saffron with other plants at levels of the order of 200 mg/g (Shawky et al., 2020). In this line, it is necessary to develop reliable, fast, cheap, as well as non-invasive alternative techniques to measure the authenticity of saffron.

This paper presents two new tools to detect fraud in the saffron sector. On the one hand, UV-VIS spectroscopy is used, and on the other, the combination of optical images and intelligent algorithms. (Pradana-López et al., 2021). The different samples were prepared by mixing pure seasonal saffron with past saffron, in concentrations of 20% to 40%. In addition, samples of pure saffron mixed with floral remains of the plant itself in concentrations of 7.5% to 12.5% were prepared.

The already prepared samples were measured by UV-VIS emission spectroscopy, obtaining promising results in distinguishing pure from adulterated saffron. Following, the prepared samples were photographed with a microscope and a reflex camera to make the intelligent models. The results in the validation of the developed model amount to 90%. For all these reasons, these techniques represent promising ways to detect fraud in saffron.

REFERENCES

S. Li, et al (2020). Rapid detection of saffron (Crocus sativus L.) Adulterated with lotus stamens and corn stigmas by near-infrared spectroscopy and chemometrics, Industrial Crops and Products, Volume 152, 112539, ISSN 0926-6690

E. Shawky, et al. (2020). NIR spectroscopy-multivariate analysis for rapid authentication, detection and quantification of common plant adulterants in saffron (Crocus sativus L.) stigmas, LWT, Volume 122, 109032, ISSN 0023-6438.

S. Pradana-López et al. (2021). Deep transfer learning to verify quality and safety of ground coffee, Food Control, Volume 122, 107801, ISSN 0956-7135