

SPECTROSCOPY AS A RAPID METHOD FOR DETECTING PAPRIKA POWDER ADULTERATION

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Abstract: Paprika powder, a spice known for imparting flavour, colour and aroma in foods has recently become compromised by fraudulent activities involving diverse adulterants such as corn flour and has prompted quality assurance (QA) measures. Near infrared spectroscopy (NIRS) is a non-destructive method gaining grounds in QA applications. The study applied NIRS to detect paprika powder adulterated with corn flour. Chemometric evaluation spectra showed that NIRS could discriminate corn-flour adulteration with 100% classification accuracy. Adulteration was also predicted with high accuracies coefficient of determination (R^2CV) between 0.97 and 0.99 and low errors (0.72 g/100g), proving the future QA applications of NIRS.

Keywords: Spectroscopy, adulteration, quality, chemometrics, authentication

INTRODUCTION

Urbanization and increasing population has resulted in surge in demand for products and services associated to fast-paced city living, especially, convenient or semi processed food products that mostly in the ready-to-eat state and are therefore time saving (Osman et al. 2014). More importantly, convenient food products such as powdered food products are made available in hypermarkets and supermarkets near to the consumers. Thus, it replaces the traditional ways of cooking food with those that are less involving, fast and provides the equal desired features in the food. The fast growth of disposable income among consumers in urban area has enabled them to have more opportunities to consider a wider array of products and services compared to those in rural area but this has equally triggered greed and fraudulent activities in the food chain. *Capsicum annum* is a group of vegetable spices widely consumed for their nutritional benefits such as vitamin C, red pigments and carotenoids. Frequent consumption of red pepper or its products has been acknowledged to promote glucose and lipid metabolism while stimulating the immune system to delay the aging or even prevent cancer (Yang et al. 2017). Its powdered form has recently become a preferred option as a spice for imparting flavour, color and aroma in diverse cuisines. However, its quality is often compromised. The supply chains of the paprika industry involve a matrix of lengthy sequences often involving a complex nature of the processes that avails several points of possible criminal adulteration activities. It's bright red color, mostly attributed to the presence of Capsanthin and capsorubin antioxidants (De Lima Petito et al. 2016) is, sometimes manipulated for selfish gains by producers who use diverse types of adulterants. One of such adulterants that has recently come under suspicion is corn flour. It is often done with the intention of deceiving the consumer even though consumers have the right to know that the food they eat is safe and suitable for consumption. Food fraud is disagreeable at best and at worst sometimes presents serious health concerns (Erum, Dam, and Deyn 2019). In view of authentication and quality assurance (QA) in this fast-moving industry, rapid, non-destructive methods are promising for future QA applications. Near infrared spectroscopy (NIRS) is one of such methods gaining grounds for its sensitivity, ease of application and cost efficiency. It operates with a light absorption pattern at wavelengths between 700 nm (13,300 cm^{-1}) and 2500 nm (4,000 cm^{-1}) and is performed in combination with chemometrics for chemical fingerprints of foods. NIRS has been used for the determination of Sudan I-II-III-IV dye adulteration in spices (Di Anibal et al. 2009), identification of papaya seeds in black pepper (Orrillo et al. 2019), paprika adulteration with lead chromate, 3% (w/w) lead oxide 5% (w/w) silicon dioxide, 10% (w/w) polyvinyl chloride, and 10% (w/w) gum Arabic (Horn et al. 2018). The aim of this study was to test the feasibility of two different NIRS instruments in detecting adulteration of paprika powder with corn flour through chemometric data evaluations.