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THE APPLICATION OF POLYACRYLAMIDE GEL ELECTROPHORESIS FOR FOOD AUTHENTICATION AND QUALITY EVALUATION

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With globalization and modernization of the food supply chain and the increasing market competition, the authenticity of food products has become an urgent issue worldwide. Consumer awareness about food quality and safety, geographical origin, and agricultural practices have constantly increased in the last decade. Determination of food authenticity has been performed by using numerous analytical methods such as physicochemical, liquid, and gas chromatography, isotope ratio analysis, DNA-based methods, and spectroscopic techniques. However, many of these methods are time-consuming, required sophisticated analytical equipment, and well-trained personnel. Therefore, the demand for reliable, rapid, and cost-effective authentication methods is increasing. One of the classical separation methods, that fulfill these requirements is the polyacrylamide gel electrophoresis (PAGE). PAGE coupled with chemometric tools can provide chemical fingerprints for species or origin determination, and detection of food adulteration. Native-PAGE was successfully applied for the detection of caprine and ovine milk adulteration; SDS-PAGE was used for the determination of liquid egg and meat adulterations as well as for the authentication of berries, peanut, and almond varieties; urea-PAGE was applied to detect cheese adulteration. Furthermore, due to numerous variations of amino acid sequences, a variety of attached prosthetic groups, and specific binding capabilities, proteins can interact with different bioactive molecules such as phenolics resulting in their different electrophoretic mobilities, allowing the detection of these interactions using PAGE techniques. Thus, PAGE can be used for the evaluation of the quality of functional food obtained through enrichment with phenolics or the influence of phenolics on in-mouth sensory properties of food. However, the determination of protein profile and proteolytic activity in food matrices is one of the most common PAGE applications. Although a number of analytical methods have been applied for food authentication and quality evaluation, so far, no universal catch-all method exists for all aspects of its characterization.

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INFLUENCE OF DRYING METHOD ON THE ANTHOCYANINS CONTENT IN THE GRAPE POMACE SKINS

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After red wine production, a significant amount of grape pomace skins (GPS) is generated, known as a potentially good source of phenolic compounds. However, high water content limits their subsequent application due to the negative effects on their stability. So far, various preservatives (metabisulfites and benzoates) and their combination with γ-radiation have been most commonly used to maintain anthocyanins content and extend the shelf life of the GPS. But, various drying methods are increasingly being examined for GPS processing. Therefore, the aim of this study was to determine the effect of different drying methods (oven-drying and lyophilisation) on the anthocyanins content of Prokupac GPS. Anthocyanins were extracted from untreated and dried GPS with acidified methanol, evaporated to dryness, and reconstituted in milliQ water. Separation, detection, and quantification of individually anthocyanins were performed using an UHPLC- LTQ OrbiTrap MS. Anthocyanins have been identified based on retention times, molecular masses of the molecular ions ($[M-H]^+$), individual MS^2, MS^3 and MS^4 fragment ions and data from the literature. In total, sixteen anthocyanin derivatives were identified in all analysed GPS extracts, primarily malvidin derivatives (57.5-82.6% of total quantified anthocyanins). The highest content of total anthocyanins was detected in the lyophilised GPS extract (3465.8 mg/kg DW); almost three times more than in the extract of oven-dried (1141.2 mg/kg DW) and untreated (1058.7 mg/kg DW) GPS. The most abundant compound was malvidin 3-O-glucoside (790.8; 412.9; and 633.8 mg/kg DW in extracts of untreated, oven-dried, and lyophilised GPS, respectively); followed by 3-O-glucoside of peonidin, petunidin, and delphinidin. In addition, coumaroyl, acetyl and caffeoyl anthocyanin derivatives were found in all analysed extracts. However, their highest content was confirmed in lyophilized extracts, primarily malvidin-3-O-(6"-p-coumaroyl)hexoside (826.1 mg/kg DW). Based on data, Prokupac GPS can be a good source of anthocyanins, which can potentially be valorised and used as natural pigments and functional additives in the food industry.

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