JRIFST

www.journals.rifst.ac.ir
Journal of Research and Innovation
in Food Science and Technology

Volume 10, Issue 1, June 2021, Pages 71-82
Document Type: Extended Abstract
DOI: 10.22101/JRIFST.2021.271556.1224

Extended Abstract

Enrichment of Pomegranate Juice Pigments with Polymeric Resins and Preparation of its Powder by Spray Drying Method

Maryam Manzari Tavakoli[1], Samad Nejad Ebrahimi[2*], Hassan Rezadoost[2], Mohammad Hossein Mirjalili[3]

1- PhD. Student, Department of Phytochemistry, Medicinal Plants and Drugs Research Institute, Shahid Beheshti University, Tehran, Iran
2- Assistant Professor, Department of Phytochemistry, Medicinal Plants and Drugs Research Institute, Shahid Beheshti University, Tehran, Iran
* Corresponding author (s_ebrahimi@sbu.ac.ir)
3- Associate Professor, Department of Agriculture, Medicinal Plants and Drugs Research Institute, Shahid Beheshti University, Tehran, Iran

Received: 2021.02.02; **Accepted**: 2021.04.27

Abstract

Pomegranate juice is a known natural source of anthocyanins, including the glycosidic derivatives of delphinidin, cyanidin, and pelargonidin. The use of resins in various industries has a long history and, in this study, resin was used to enrich anthocyanins in pomegranate juice. The anthocyanin pigment in pomegranate juice was isolated and purified by SEPLITE®LXA10 resin, and finally, the anthocyanin powder was obtained by spray drying with high quality and efficiency. The purity of enriched anthocyanins is above 90%, while the amount of pigment in pomegranate itself is 20% or less. The yield of the powder obtained from enriched anthocyanin was 89.6% and pomegranate juice was 21%. The proposed method led to enrichment of anthocyanins by resins and removal of unnecessary additives and increases the quality and intensity of natural dye obtained. Scanning electron microscopy (SEM) images of anthocyanin-enriched powder showed a uniform, spherical structure of particles that were of better quality than pomegranate juice powder. Particle sizes were between 1 and 6 μm with a spherical structure. Due to the high cost of anthocyanins, its use in the food industry and high imports into the country, we obtained a relatively pure anthocyanin pigment. Purification of anthocyanins from pomegranate juice is an economical method for producing natural red pigment and its uses in the cosmetics, health and food industries.

Keywords: Absorption resins, Anthocyanin, Pomegranate fruit, Spray dryer

Introduction

Anthocyanins cause red, purple, and blue colors in many flowers, fruits, and vegetables, which are considered by the relevant industries due to their unique biological properties. Pomegranate, which was originally grown in Iran and is a valuable medicinal and nutritional fruit, can be turned into pomegranate juice powder to be available in other seasons and used as a valuable ingredient in other food and medicinal products (Jafari, Ghalenoei, & Dehnad, 2017). The technology of resin adsorption is being used to concentrate polyphenols and to remove sugars. The resins allow adsorption of polyphenols from aqueous solution, and desorb phytochemicals in organic solvents, such as methanol or ethanol. Sugars do not interact with resins, and they can be easily removed by water elution (Buran *et al*., 2014). The use of resins

in various industries has a long history and, in this study, the resin was used to enrich anthocyanins in pomegranate juice.

Materials and methods

In this study, SEPLITE® LXA10 resin was used for isolation and enrichment of anthocyanin pigments in pomegranate juice, and then anthocyanin powder was obtained by spray drying. For this purpose, the resin was soaked in ethanol, then was treated with degassed water to remove ethanols from the resin surface. Then, the pomegranate juice was loaded onto the resin and allowed to interact between the resin and the pomegranate juice. In order to separate the phenolic and anthocyanin materials adsorbed on the resin, the resin was washed by different ratios of water-ethanol solvent by gradient elution system to desorb the material from the resin surface. Based on the spectrophotometric results, pomegranate juice and the fraction with the highest amount of anthocyanin were mixed with maltodextrin in ratios of 1:1, 1:2, 1:3, and 1:4 and turned into powder by spray drying. The powders were examined by spectrophotometer (UV-Vis), scanning electron microscope (SEM), and high-performance liquid chromatography (HPLC). Total monomeric anthocyanin pigment content of powders determined by the pH differential method, which is a rapid and simple spectrophotometric method based on the anthocyanin structural transformation that occurs with a change in pH (colored at pH 1.0 and colorless at pH 4.5).

Results and discussion

The results showed that the best ratio of maltodextrin for microencapsulation of pomegranate juice anthocyanins is 1:4. At lower ratios of maltodextrin, anthocyanin particles adhered to the walls of the dryer, thereby reducing the production efficiency of anthocyanin powder. Our results showed that, the purity of pomegranate powder is 20% or less, while the amount of pigment in the enriched anthocyanins is above 90% (Fig. 1). According to the results of total monomeric anthocyanin pigment content measurement by pH-differential method, the amount of anthocyanin in pomegranate juice and enriched anthocyanin powder is 2.37 and 11.21 mg/L, respectively. The results of SEM images showed, enriched anthocyanin powder has spherical structure with particle size of 1 and 6 μm.

Fig. 1. Comparison of enriched anthocyanin and pomegranate juice powder

Conclusions

Due to the high cost of anthocyanins, its use in the food industry and high imports into the country, we obtained a relatively pure anthocyanin pigment. The results of HPLC, SEM, total monomeric anthocyanin pigment content, and apparent color intensity in enriched anthocyanin powder indicate the success of enrichment of anthocyanins with SEPLITE® LXA10 resin and the amount of anthocyanin in pomegranate juice after enrichment with this resin to increase significantly. Purification of anthocyanins from pomegranate juice is an

economical method for producing natural red pigment and its uses in the cosmetics, health and food industries. The anthocyanin powder enriched in this study can be compared with imported samples of this valuable pigment.

References

Buran, T. J., Sandhu, A. K., Li, Z., Rock, C. R., Yang, W. W., & Gu, L. (2014). Adsorption/desorption characteristics and separation of anthocyanins and polyphenols from blueberries using macroporous adsorbent resins. *Journal of Food Engineering, 128*, 167-173. doi:https://doi.org/10.1016/j.jfoodeng.2013.12.029

Jafari, S. M., Ghalenoei, M. G., & Dehnad, D. (2017). Influence of spray drying on water solubility index, apparent density, and anthocyanin content of pomegranate juice powder. *Powder technology, 311*, 59-65. doi:https://doi.org/10.1016/j.powtec.2017.01.070