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Review Article

Anthocyanin Extraction from Winery Waste Material: A Review

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Abstract

Now a day's growing demand for eco-friendly/non-toxic colorants, specifically for health sensitive applications such as coloration of food. Recently, colors derived from natural sources for these applications have emerged as an important alternative to potentially harmful synthetic colors. Natural color is one of the crucial factors for the consumer's acceptability of any processed foods. The potential sources of coloring pigment anthocyanin are present in wine waste material. Extraction of these natural color used various novel techniques like soiled-liquid, Dynamic superheated liquid extraction, Ultrasonics and pulsed electric fields techniques. Anthocyanin color can be used as a natural additive for food, cosmetics and pharmaceutical. It can be a good source of antioxidants. Aim of this study is that to how to extract natural color, study various novel techniques of extraction especially soiled-liquid, Dynamic superheated liquid extraction, ultarsonics and pulsed electric fields techniques and their efficiency and suitability.

Key words: Wine Waste, Dynamic superheated liquid extraction, Ultrasonics, Pulsed electric fields, Health Benefits.

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1. Introduction

Anthocyanins (Greek *anthos*-flower and kianos-blue) used originally to describe the red and blue pigment, are an important group of water-soluble plant pigments. They belong to the most common class of phenolic compounds. These pigments are responsible of the shiny orange, pink, red, violet and blue colors in the flowers and fruits of some plants [5].

Now days the food industry is searching for value-added products that can be produced from the waste generated by agricultural industries. Agricultural waste by-products include items such as seeds, peel, stalks, stems and leaves. These waste by-products contain a variety of biologically active species, such as antioxidant polyphenols, that have application in the pharmaceutical, cosmetic and food industry. Grape (*Vitisvinifera*) is one of the world's largest fruit crops. Wine, grapes and grape seed extracts are a major source of

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polyphenolic components such as anthocyanins. Polyphenolic compounds have potential health-promoting and disease-protective qualities because of their high antioxidant activity. Foods high in antioxidants have been associated with reduced risk of chronic health disorders including cancer and coronary heart diseases. The use of grape pomace as a functional ingredient in a food would not only find an application for a waste product generated during winemaking but the resulting product could also provide health benefits [2].

Anthocyanins are natural colorants which have raised a growing interest due to their extensive range of colours, innocuous and beneficial health effects. Despite the great potential of application that anthocyanins represent for food, pharmaceutical and cosmetic industries [1].

Anthocyanins are of particular interest to the food colorant industry due to their ability to impart vibrant colors. Anthocyanins have been incorporated into the human diet for centuries and have been used as traditional herbal medicines due to their diverse physiological abilities to treat conditions such as hypertension, pyrexia, liver disorders, dysentery and diarrhea, urinary problems and the common cold. Recently anthocyanin-containing materials are being incorporated into food products. Therefore, they can be incorporated as a functional food ingredient into our diet. Currently, anthocyanin are being used for the production of naturally colored blue tortillas. Incorporating anthocyanins as food colorants is not only valuable for improving overall appearance but also is very beneficial to our health [9].

Color Extraction Techniques:

Extraction of Anthocyanin from winery waste carried out by some novel techniques like especially soiled-liquid, Dynamic superheated liquid extraction, ultarsonics and pulsed electric fields techniques.

1) Solid-liquid extraction techniques:-

The solvent extraction has been the most common method for extraction of diverse compounds found in fruits, including flavonoids. The phenolic compounds have been extracted by grinding, drying or lyophilizing fruits, or only by soaking fresh fruits with subsequent solvent extraction. Anthocyanins are polar molecules, thus the most common solvents used in the extractions are aqueous mixtures of ethanol, methanol or acetone. Among the most common methods are those which use acidified methanol or ethanol as extractants. From these methods, the extraction with methanol is the most efficient. In fact, it has been found that in anthocyanin extractions from grape pulp, the extraction with methanol is 20% more effective than with ethanol, and 73% more effective than only water nevertheless, in food industry ethanol is preferred due to the methanol toxicity [1].

2) Dynamic superheated liquid extraction techniques:-

Superheated liquid extraction (SLE) has been successfully applied to the extraction of different phenolic compounds from grapes – e.g. catechins and proantho cyanidins from grape seeds and trans-resveratrol from grapes. Superheated liquids can be an attractive industrial alternative for the extraction of these compounds with two fundamental advantages over conventional techniques, namely: (a) Raising the temperature above the boiling point of the solvent increases the diffusion rate, solubility and mass transfer of the compounds and decreases the viscosity and surface

tension of the solvent. These changes improve the contact of the compounds with the solvent and enhance extraction, which can then be achieved more rapidly and with less solvent consumption as compared with conventional industrial methods. (b) The absence of light and air significantly reduce both degradation and oxidation of these compounds during extraction [8].

3) Ultrasonic assisted extraction techniques:-

In this extraction method involves the use of ultrasound with frequencies ranging from 35 KHz; this increases the permeability of cell walls and produces cavitations. Due to cavitation break down of cell membrane and internal material (color and oil) comes out. Ultrasonics extraction was carried out in an ultrasonics bath (SonorexBandelin RK 100H) with heating frequency of 35 KHz (Schalltec, Morfelden-Walldorf, Germany), at 70 °C held during 1 hr. A total extraction from winery waste material was carried out in a water bath incubated at a temperature of 70 °C held during 3 h. In this case, the solid/liquid ratio was increased to 1:20 [7].

4) Pulsed electric fields extraction techniques:-

A pulsed electric field treatment was applied using a Pure Pulse (Pure Pulse Technologies, San Diego, USA) exponential decay pulse generator with a maximum voltage of 10 kV and a maximum average power of 8 kW. The peak pulse voltage used was 9 kV, resulting in an electric field strength of 3 kV cm−1. A series of 30 pulses was applied at ambient temperature to obtain a specific energy input of 10 kJ kg−1. The temperature increase after the treatment was less than 3 °C. A parallel plate treatment chamber consisting of stainless steel electrodes with an electrode area of 140 cm^2 and a gap of 3 cm was used. The pulse repetition rate was 2 Hz, the total treatment time was 15 s, for filling and unfilling of the sample the time required was 1 min. The subsequent extraction was performed at 70 °C and held during 1 h in a shaken Erlenmeyer flask [7].

Anthocyanins Health Benefits:-

1. Anthocyanins have been shown to be potent antioxidants as well as anti-diabetic, anti-carcinogenic and having ocular effects among others. Findings of their beneficial health effects support their role as natural food colorants, functional foods and dietary supplements. Anthocyanins are estimated to be widely consumed by humans with the estimated daily intake about 12.5 mg/d in the United States [9].
2. The consumption of anthocyanins may play a significant role in preventing lifestyle-related diseases such as cancer, diabetes, and cardiovascular and neurological diseases.

Purified anthocyanins or anthocyanin-rich extracts on in vitro experimental systems have confirmed the potential potency of these pigments. Demonstrable benefits include protection against liver injuries; significant reduction of blood pressure; improvement of eyesight; strong anti-inflammatory and antimicrobial activities; inhibition of mutations caused by mutagens from cooked food; and suppression of proliferation of human cancer cells.

Anthocyanin-rich mixtures and extracts have been used historically to treat conditions as diverse as hypertension, pyrexia, liver disorders, dysentery and diarrhea, urinary problems including kidney stones and urinary tract infections [6].

2. Conclusion

The application of advanced technologies such assoiled-liquid, Dynamic super heated liquid extraction, ultrasonics and PEF has demonstrated to offer an extraordinary potential and increases rate of extraction of natural color as compared to other cultural techniques selectivity for extraction purposes. The combination of effective extraction technologies and low-cost raw materials represent an environmental and economical alternative to conventional extraction methods where large amounts of organic solvents and long extraction times are required. The use of these novel processing technologies will reduce food processing wastes and facilitate the production of natural valuable products which will guarantee food sustainability and meet consumer demands.

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