

Optimized Method for the Aqueous Extraction of Anthocyanins from Fruit Waste

Market and Background

Anthocyanins are polyphenolic compounds commonly found in fruits, dark leafy vegetables, some grains, and flowers. The primary commercial use for anthocyanins is as colorants for shades of red, purple, and blue in the food and beverage industry. These compounds are also recognized for their antioxidant, anti-inflammatory, anti-cancer, and cardioprotective properties and are used in the vitamin and supplement industry. As consumers become more health conscious and take note of what's being added to the food and beverages they consume, manufacturers are beginning to incorporate more natural ingredients rather than the synthetic variants. As anthocyanins are naturally derived compounds, they are seeing an increase in use, an increase in their overall market share, and are expected to remain the fastest growing category through 2021 in the Natural Food Coloring Manufacturing Industry according to an IBISWorld market report.

Fruits such as cranberries, cherries, blueberries, and others typically contain high concentrations of anthocyanins. However, 30-40% of these compounds remain trapped in the skin and seeds in the form of membrane and cell wall complexes or polymerized networks of anthocyanins (e.g. proanthocyanidins). As such, waste from fruit processing (e.g. pomace) serves as a unique source of untapped anthocyanins. Various techniques exist for extracting anthocyanins from pomace, but each has their drawbacks. Mechanical technologies have high start-up costs and limited throughput as they depend on specialized equipment. Chemical technologies have high operating costs and may disqualify products from food and supplement applications. Finally, while extremely effective, enzyme dependent treatments also have high operating costs and require the use of purified enzymes. There is an unmet need for an efficient, cost-effective, and food-safe method for the extraction of anthocyanins remaining within fruit waste.

Research and Development Status and Commercialization Needs

A Professor of Chemistry at the University of Wisconsin – Parkside has developed a system that uses microbial digestion as a mechanism for freeing anthocyanins for aqueous extraction from cranberry pulp. By using a dual microbial treatment, this system demonstrated improved anthocyanin extraction up to 435% in 24 hours and 10,640% in 48 hours as compared with control samples. This system also demonstrated that the anthocyanin concentrations overall stabilized from 24-48 hours. These microbial sources are preferable to purified enzymes as they are inexpensive, renewable, and in many cases, readily in use in the food industry. Currently, the appropriate mixture, concentration, and duration of fermentation has been determined for this system. Experiments have begun to increase the scale of this system. WiSys is seeking a strategic partner interested in providing a route to market for the commercialization and use of this anthocyanin extraction system. There is also interest in partnering with a fruit processing company for the continued testing and scaling of this system.

Applications and Key Benefits

- Extraction of value-added anthocyanin compounds from waste products in the fruit processing industry
- Anthocyanin compounds extracted are naturally derived and desirable in the food coloring industry and the supplement and vitamin industry
- System demonstrates significantly high anthocyanin extraction levels compared with control samples.
- System for extraction makes use of proprietary blend of low cost and renewable microorganisms
- No requirement of high-cost specialized equipment
- While optimized for cranberry pulp, the system could be adapted to other anthocyanin rich waste products

Intellectual Property

A provisional patent is pending for this technology. For more information, please contact Jennifer Souter at jennifer@wisys.org or by phone at 608-316-4131.