

Floral Pigments

A New Arena for Eco-friendly Products

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Natural pigment extraction from flowers is a vital area of research with diverse applications across industries. These pigments, responsible for flower's vibrant colours, exhibit unique biological activities, including antioxidant, anti-inflammatory and anticancer properties. Natural pigments offer a sustainable alternative to synthetic colorants, mitigating environmental and health risks. Their biological activities make them promising for developing products with potential health benefits. In food industry, natural pigments enhance sensory qualities and provide health benefits. In pharmaceuticals, they give new treatments due to their antioxidant and anti-inflammatory properties. In cosmetics, these pigments protect skin. By exploring natural pigment extraction, researchers can create new products with health benefits and environmentally friendly nature. This field holds potential for sustainable product development and innovation across industries, driving growth and opportunities in various sectors.

Among natural flower pigments, carotenoids, anthocyanins and betalains are powerful antioxidants responsible for diverse hues. A classic example of flowers with anthocyanin - based colours are roses, which are renowned for their stunning colors and intoxicating fragrance, making them one of the most beloved and iconic flowers globally. Petunias are another group of

flowers which are available in a range of colours, including red, purple, and blue, due to anthocyanins. Petunias are versatile, widely cultivated annual flowers commonly used to add vibrant colors to gardens, landscapes and container arrangements. Another group of flowers are pansies, which due colour diversity, are a popular choice for gardens and containers. Carotenoid imparts red, orange and yellow colour. It is present abundantly asteraceae family floral petals like sunflower, marigold and nasturtium. Sunflowers via bright appearance bring positivity in surroundings. Similarly, marigolds are popular annuals that are often used in gardens and containers due to their bright colours and ability to repel pests. Nasturtiums, a unique rambler add colour to low lying areas of landscapes through yellow, orange and red hues. These look beautiful with contrast green leave in gardens and containers due to their bright colours and delicate, crepe-paper-like petals.

Betalains is another unique floral pigment which is found in flowers like Bougainvillea and Poinsettia. Bougainvillea due to colourful hues, are utilized as edible flowers in five star restaurants, besides used in gardens and containers, whereas poinsettias (*Euphorbia pulcherrima*) with vibrant red and pink colors are often used in decorations and festivals.

Floral pigment extraction methods

One of the most adapted floral extraction method is solvent extraction method which involves using solvents like ethanol or methanol due to its

efficiency and effectiveness. The choice of solvent depends on the type of pigment being extracted and the desired level of purity. Solvent

extraction can be performed using various techniques, including maceration, Soxhlet extraction and ultrasound-assisted extraction method.

Thermal technologies are another high efficient extraction methods which involves microwave-assisted extraction and ohmic heating and are often used in combination with solvent extraction to improve the yield and quality of extracted pigments. Microwave-assisted extraction through microwave energy, rapidly accelerates the extraction process, whereas Ohmic heating uses electrical resistance to heat the solvent and plant material, providing a gentle and efficient extraction method.

Non-thermal technologies are another floral extraction methods which involves techniques like ultrasound-assisted extraction and pulsed

electric fields and are often used to extract delicate pigments that may be damaged by heat or other forms of energy. Ultrasound-assisted extraction uses high-frequency sound waves to disrupt the plant cells and release the pigments into the solvent. Pulsed electric fields use electrical pulses to create temporary holes in the plant cells, allowing the pigments to be extracted. Another technology uses a supercritical fluid extraction method which is a gentle and efficient method that can be used to extract a wide range of natural pigments. The most commonly used supercritical fluid is carbon dioxide, which is non-toxic and environmentally friendly. Supercritical fluid extraction can be used to extract pigments with high purity and yield, making it an attractive option for industries that require high-quality natural pigments.

Applications of floral pigments

Food Industry: Natural pigments can be used in food colouring and functional foods, such as beverages, baked goods, and confectionery products to create unique and appealing colours to consumers.

Pharmaceutical Industry: Natural pigments have antioxidant and anti-inflammatory properties, making them a promising area of research for developing new drugs or supplements. They can be used to create natural

remedies for various health conditions, such as inflammation, oxidative stress and cancer.

Cosmetic Industry: Natural pigments can be used in skincare products due to their antioxidant and anti-inflammatory properties, which may help protect the skin against damage and promote healthy aging. They can be used in a variety of skincare products, such as creams, lotions and serums in order to provide natural and effective skin care solutions.

Conclusion

Natural pigments from flowers offer a promising area of research with potential applications in various industries. Further studies are needed to overcome the challenges associated with their extraction, stability and production costs. By exploring new extraction methods and applications, researchers can unlock the full potential of natural pigments from flowers and

contribute to the development of more sustainable and eco-friendly products. Hence these pigments have the potential to revolutionize various industries with their unique properties and benefits and continued research in this area can lead to innovative and sustainable solutions for a better future.