

Colourful cell factories for production of anthocyanins for health and food applications

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Anthocyanins are water-soluble pigments that colour the fruit and flowers of many plants. More than 635 different anthocyanins have been identified, distinguished by their unique degree of decoration achieved by methylation, glycosylation and acylation with both aliphatic and aromatic groups. There is mounting evidence that consumption of anthocyanin-rich food promotes health, supported by many recent studies of anthocyanin-rich fruits such as blueberry, bilberry and cranberry (1-3).

Their relative abundance in the diet and their potency against a range of chronic diseases have made anthocyanins the subject of intense research in experimental and preventive medicine and, more recently for formulating natural colours, a fast growing market. However, the limited range of anthocyanins commercially available and the expense of pure preparations mean that most research is done with crude extracts of plants which are not standardised with respect to the particular anthocyanins they contain, nor the amounts of each anthocyanin in the extract. Variations in anthocyanin decoration account for differences in colour stability and hue of anthocyanins and underpin the need for developing production systems for pure anthocyanins for investigating the effects of chemical specificity on uptake, signalling and physiology, toxicity of anthocyanins for medical applications and for developing new formulations in the natural colours industries (4).

In ANTHOPLUS and PURPLE YEAST projects robust new plant cell and yeast cultures were established for the stable production of a wide variety of anthocyanins in green factories. These unique cell cultures allow sustained, high level production of diverse anthocyanins with novel complexity in side chain decoration, or labelled with stable isotopes for assaying the composition of feedstocks for natural colours, for bioavailability, bioefficacy and mechanistic research in experimental medicine or pharmacy and as standards for assaying natural colorant extracts for improved formulations. Enhanced supplies of pure anthocyanins will be highly valuable for the colourants industry to investigate the effects of decorations, co-pigments, pH on colour and stability to provide a robust scientific foundation for developing new plant sources of natural colourants and new formulations for natural colours.

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