

A Review on Anthocyanins: Coloured Pigments as Food, Pharmaceutical Ingredients and the Potential Health Benefits

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ABSTRACT

This paper reviews the literature on occurrence of different colours and chemoprevention activity of anthocyanins, different types of anthocyanins containing food materials and their pharmacological actions. These anthocyanins are naturally available coloured compounds from different flowers, fruits and vegetables. Apart from various major pharmacological actions like anti-oxidant, anti-cancer, anti-inflammatory, anti-neurodegenerative activities, these anthocyanins are acts as natural colorants for food and beverages. Anthocyanin responsible for the colours, red, purple, and blue, are in fruits and vegetables. Anthocyanin levels are high in berries, currants, grapes, and some tropical fruits. Besides the use of anthocyanin and anthocyanin as natural dyes, these coloured pigments are potential pharmaceutical ingredients that give various beneficial health effects. Scientific studies, such as cell culture studies, animal models, and human clinical trials, show that anthocyanidins and anthocyanin possess anti oxidative and antimicrobial activities, improve visual and neurological health, and protect against various non-communicable diseases. This review focuses on the role of anthocyanidins and anthocyanin as natural food colorants and their nutraceutical properties for health. There is no evidence that anthocyanins have a harmful effect on human health. However, future research is going on pharmacological actions and use of anthocyanins.

Keywords - Anthocyanins, Pharmacological effects, Colorant, Health benefits, Diseases, Polyphenols.

I. INTRODUCTION

Polyphenols are naturally occurring substances that can be found in a variety of foods, including fruits, vegetables, cereals, and drinks. Grapes, apple, pear, cherries, and berries contain up to 200–300 mg

polyphenols per 100 gm of fresh weight. Polyphenols are present in substantial concentrations in the products made from these fruits. Polyphenols are plant secondary metabolites that play a role in protecting plants from UV radiation and disease attack. long term consumption of diets rich in plant

polyphenols offered some protection against development of cancers, cardiovascular diseases, diabetes, osteoporosis and neurodegenerative diseases. Effect of polyphenols on human cancer cell lines, is most often protective and induce a reduction of the number of tumour's or of their growth. These effects have been seen in the mouth, stomach, duodenum, colon, liver, lung, mammary gland, and skin, among other places. Polyphenols have chemoprevention effects such as estrogenic/antiestrogenic activity, antiproliferation, induction of cell cycle arrest or apoptosis, prevention of oxidation, induction of detoxification enzymes, regulation of the host immune system, anti-inflammatory activity, and changes in cellular signalling. The use of black raspberries (BRB) as a chemoprevention agent has gained interest and High concentrations of chemo preventive compounds such as the anthocyanins, ellagic acid, quercetin, and β -sitosterol have been identified in BRB. BRB and its constituent anthocyanins (AC) can decrease cell proliferation, inflammation, and angiogenesis while also promoting apoptosis, cell differentiation, and cell adhesion.

II. ANTHOCYANIN

Anthocyanins belong to a large group of secondary plant metabolites collectively known as flavonoids. Major polyphenols pigments in plants are anthocyanins. They are responsible for the red and blue pigmentation of many fruits and vegetables. The health benefits of anthocyanins have been demonstrated in several in vivo and in vitro studies.

A. Metabolism of Anthocyanin -

Dietary polyphenols undergo a complex metabolism after ingestion and interact with human and microbial enzymes, leading to the production of a large number of circulating and excreted polyphenol metabolites and catabolic products. The polyphenols and their metabolites can influence and induce a modulation of gut microbiota composition by means of several interactions. (Fig 1)

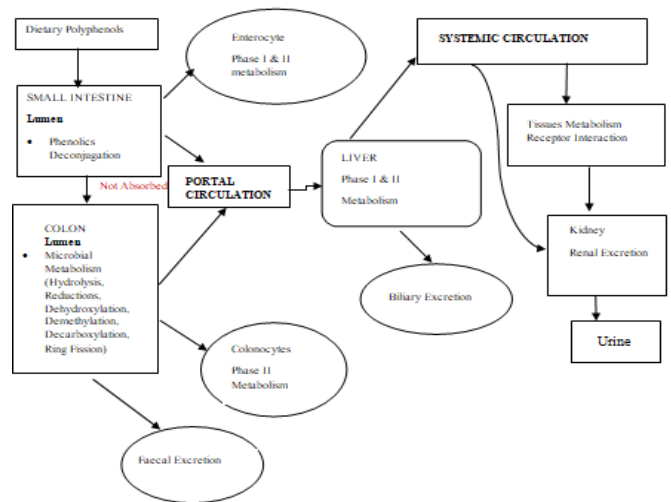


Fig 1 – Metabolism of Polyphenol

B. Mechanism of Anthocyanin -

Anthocyanins are powerful antioxidants that can help you avoid or reduce the risk of disease. Anthocyanins have been demonstrated to lessen the risk of a variety of diseases, both directly and indirectly. The colourful chemicals lessen the risk of numerous chronic diseases by scavenging free radicals and thereby reducing oxidative stress in a direct mechanism. Through the reduction of oxidative stress and lipid peroxidation, the indirect routes involve the down regulation of cell growth and apoptosis. Anthocyanins are powerful antioxidants that effectively scavenge free radicals, as we all know. Anthocyanins lower the risk of cardiovascular disease (CVD) via changing blood lipid profiles and biomarkers (Fig 2).

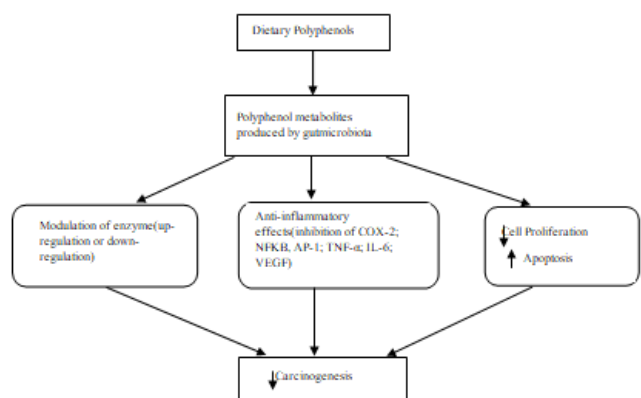


Fig 2 – Mechanism of action of polyphenol

C. Anthocyanin pigments as food colorants and additives-

In processed foods and beverages, the use of natural colourants and additives is critical for enhancing consumer acceptance. Anthocyanins are natural-coloured pigments that are taken from plants and have a pleasing tint. Anthocyanins are red, blue, and purple pigments derived from plants. Natural colourants with low to no toxicity are used in these pigments. In comparison to synthetic colourants, natural colourants appear to be safe to take even at higher dosages. Natural colourants, anthocyanins, provide value-added qualities. These qualities include antioxidants, which are used as a nutraceutical and have a variety of health benefits, including antibacterial activity and the prevention of chronic diseases.

D. Effects of dietary polyphenols on beneficial microorganisms -

Lactobacilli are important in the manufacture of fermented foods and are thought to play a positive role in the microbiota of the colon. They can be found anywhere carbohydrate-rich compounds are present and are known for their health benefits.

Lactobacillus group growth is only moderately inhibited by dietary polyphenols. Dietary polyphenols may potentially aid in the growth of specific lactobacillus strains, according to evidence. Berry phenolics were found to selectively inhibit pathogenic bacterial strains, both Gram-positive and Gram-negative, although the lactic acid bacteria group was surprisingly unaffected. A polyphenolic extract from *Mangifera indica* L. seed, high in tannins and flavones, was found to inhibit Gram-positive bacteria rather than Gram-negative bacteria, but not lactic acid bacteria, in a similar trend. In addition, *Lactobacillus acidophilus* was resistant to tea phenolic extracts.

E. Nutraceutical and pharmaceutical effects of anthocyanins –

As a nutraceutical and traditional medicine component, anthocyanin is one of the bioactive components. The bioavailability of anthocyanin as a

nutraceutical is necessary for maintaining good health and preventing illnesses.

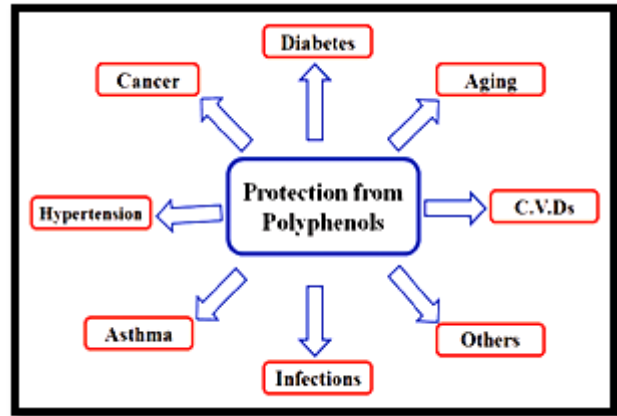


Fig 3 – Protection from polyphenols

III. CONCLUSION

Anthocyanins are plant pigments that have a variety of health benefits. Because of their significance to Berries, Anthocyanins, Cancer, Phytochemicals, and human health, interactions between dietary components, particularly phenolic compounds, and gut microbiota have gotten a lot of attention. Polyphenols and polyphenol-rich diets protect against the onset and progression of a variety of chronic pathological illnesses, including cancer, diabetes, cardiovascular disease, and ageing. These chemicals also have a neuroprotective impact and increase visual skills. Anthocyanidins and anthocyanins have been linked to a number of modes of action in the protection of various diseases. In a nutshell, the typical modes of action of these coloured pigments in disease prevention are free-radical scavenging, changes in blood biomarkers, COX and MAPK pathways, as well as inflammatory cytokines signalling. As a result, the focus of this review is on the role of anthocyanidins and anthocyanins as natural food colourants and their health-promoting nutraceutical effects.

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