

Cancer Science & Pediatrics 2019: Anthocyanin acts as scavenger for heavy metal ions, attack cancer cell and interacts with uric acid and urea to expel it through urine system - Jaleel Kareem Ahmed - University of Babylon, Iraq

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Anthocyanin is found mainly in red beet juice, cherry, red rose. It is red color pigment with high solubility in water. It is exchangeable like cation exchanger in demineralization processes of water (hetero reaction) while with the anthocyanin juice is homogenous reaction. Addition of heavy metal salt like metal nitrate (water soluble) results in sudden precipitation of metal anthocyanin and the colour of the solution disappear slowly. The pH of the solution becomes more acidic and leads to the formation of nitric acid in which the pH reaches nearly four. No precipitations shown with sodium and potassium ions while with magnesium and calcium ions need high concentration of them. Anthocyanin can be used to purify water from poisonous metals ions.

Anthocyanin colour in acidic solution is shine red which gets changed to reddish green colour in basic solution and deep red colour in neutral solutions. so, it is suitable indicator in acid-base reaction. It is more suitable than classically used phenolphthalein indicator which is water in soluble. Irrigation of red rose plant with acidic solution like hydrochloric acid result in changing the colour of the rose from deep red to shine red, also that happen when red rose plant left in acidic atmosphere.

This is a good test for detection of acidic rain in industrial area. A case study was carried out on the urine of a man of (40) years old. Two urine samples were taken from the urine system of the person, one after drinking concentrated red beet juice (mechanically extracted) and the second one without drinking juice. The results showed that: anthocyanin formed hydrogen bonding with uric acid and urea enhancing detoxification of both of them from blood; anthocyanin lowers the acidity of urine which is good for lessening human tension; anthocyanin reduces viscosity of urine even less than that of pure water which enhance the flow of urine through urine system;

Reduces conductivity of urine i.e. captures proton of uric acid; Changes color of urine from yellow to pink as shown in figure below. proton in its juice from red beet nearly 6.4 while in red rose juice more acidic.i.e. $pH < 6.4$. The radius of exchangeable proton= $(1.5/106) * 10^{-9}$ nanometer (nm) thus it is called trans membrane proton.

Anthocyanins are colored water-soluble pigments belonging to the phenolic group. The pigments are in glycosylated forms. Anthocyanins responsible for the colors, red, purple, and blue, are in fruits and vegetables. Berries, currants, grapes, and some tropical fruits have high anthocyanins content. Red to purplish,

blue-colored leafy vegetables, grains, roots, and tubers are the edible vegetables that contain a high level of anthocyanins. Among the anthocyanin pigments, cyanidin-3-glucoside is the major anthocyanin found in most of the plants. The colored anthocyanin pigments have been traditionally used as a natural food colorant. The color and stability of these pigments are influenced by pH, light, temperature, and structure. In acidic condition, anthocyanins appear as red but turn blue when the pH increases. Chromatography has been largely applied in extraction, separation, and quantification of anthocyanins. Besides the use of anthocyanidins and anthocyanins as natural dyes, these colored 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 anthocyanins possess antioxidative and antimicrobial activities, improve visual and neurological health, and protect against various non-communicable diseases. These studies confer the health effects of anthocyanidins and anthocyanins, which are due to their potent antioxidant properties. Different mechanisms and pathways are involved in the protective effects, including free-radical scavenging pathway, cyclooxygenase pathway, mitogen-activated protein kinase pathway, and inflammatory cytokines signaling. Therefore, this review focuses on the role of anthocyanidins and anthocyanins as natural food colorants and their nutraceutical properties for health.