

Food Additives: Natural Food Dyes

food-science, natural-dyes

UfukAyyildiz 1 March 15, 2020, 3:16pm

The demand for natural additives in the food industry is increasing as a response to an increasingly demanding market for the appeal of what is natural, as well as concerns about the health risks that some artificial additives pose.

Several studies indicate that there are potential risks arising from the consumption of artificial dyes, ranging from genotoxic and carcinogenic effects to the development of urticaria, asthma, nausea, eczema, bronchitis, bronchospasm, headache, reduced blood coagulation, hyperactivity and increase of iron and zinc urinary excretion in children, even at concentrations recommended as safe. As a result, interest in the substitution of artificial dyes for natural alternatives increases.

Natural dyes can be classified as tetrapyrrolides (chlorophylls), isoprenoids (carotenoids: betacarotene, bixin, astaxanthin, curcumin, among others), benzopyrans (flavonoids and anthocyanins), N-heterocyclic compounds (betalains), quinones (carmine), caramel (which are the result of processing sugars). These dyes confer varying coloring depending on their chemical structure and class, covering spectra of yellow, orange, red, purple, green and brown. In addition, other dyes have been studied for their application in foods, such as genipin, which may show staining that varies from blue to black.

Three important classes of natural dyes that can be used in food and present biological activity, but have great limitations with regard to stability are carotenoids, anthocyanins and betalains. Carotenoids are tetraterpenoid compounds, as they are formed by the union of eight isoprenoid units, having a long chain of conjugated double bonds that form a chromophore system, which gives it the coloring pigment characteristic that varies between yellow, orange and red, present in various foods. Various changes in its primary molecular structure, such as cyclization, hydrogenation, dehydrogenation, introduction of oxygen-containing groups, rearrangements, chain shortening or combinations of these modifications, result in an immense variety of molecules belonging to this group, so that more than 650 carotenoids were isolated and characterized, disregarding the cis and trans isomers, and about 100 of these have already been identified in foods. Beta-carotene, alphacarotene and beta-cryptoxanthin are pro-vitamins A, and lutein, zeaxanthin and lycopene do not have this activity. Because they are lipids, carotenoids are essentially hydrophobic. Although stable at pH changes, they are sensitive to light and high temperature, especially in the presence of oxygen.

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The biggest problem with natural dyes or food colors is its expensive to use as we as lack color stability in formulated food products that undergo heat treatment as well to exposure to light.

Until now, there is no exact equivalent for synthetic dyes in terms of cost, efficiency, and color stability.

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