

Leveraging the Power of Color

By Lynn A. Kuntz, Editor-in-Chief

Color can stimulate appetite and, in many foods, it signals intense flavor and quality—or its lack thereof. Freshness, ripeness, degree of cook, nutritional value and “richness,” or conversely, oxidation and spoilage, all have color cues. The food industry uses certified (artificial) and “exempt” (natural) colorants to meet consumer expectations, enhance their products, and maintain consistency in the face of seasonal and regional variability of the natural ingredients.

“Colors can be used in many ways: to enhance the appeal of a product, to replace more-expensive ingredients, or to replace ingredients that are in short supply,” says a spokesperson from the Color Group of Sensient Technologies Corporation, St. Louis. “Clear targets, in terms of targeted shade, cost-in-use, etc., are a must.”

Colorful choices

To create the highest quality and provide value, product designers must ensure proper colorant use. Byron D. Madkins, director, food and beverage development and applications—color, Chr. Hansen, Milwaukee, offers the following advice: “It is critical to ensure that you have the best color shade for the finished product to match the flavor profile and/or target market. This will make the product most marketable.”

In addition to the desired shade, currently one of the top considerations is natural vs. artificial. However, ingredient format, stability and cost-in-use deserve equal scrutiny. Throughout much of modern food processing, artificial colors were widely used because of: their intensity, which required smaller quantities; low price; superior stability and uniformity; lack of flavor; and ability to easily blend together to create a wide range of hues. But the last several years have seen an increasing demand for natural products, including colors. With increasing demand came better technology, resulting in products with improved characteristics in terms of stability, ease of use and price.

If label and marketing considerations demand natural colors, the choice is moot. But, “typically, synthetic colors are less expensive than natural colors,” says the Sensient spokesperson. “However, the relative cost of any color is usually a very small percentage of the overall product cost. Additionally, there are certain shades in certain applications that are easier to achieve with natural colors.”

For example, “any time you see a brownish-red to golden-yellow to brown color, caramel color is going to perform well, as well as be very cost-effective,” says David Tuescher, assistant technical director, Sethness Products Company, Clinton, IA.

Coloring your world

Technically speaking, “the most important consideration is to be certain that the color system that has been selected or recommended will be stable in the finished product, both during processing and for the desired shelf life for the product,” says Madkins.

“Colors that are not stable for a given application, that break down or change in the processing of the food, or degrade over the product shelf life due to light, heat or chemical interactions, cause you to possibly use more than would be needed with a more-stable color option and/or even make your product less marketable—unattractive or unappealing—on the store shelf,” continues Madkins.

Many factors negatively impact colors and should be avoided, says Jeff Greaves, president, Food Ingredient Solutions LLC, Teterboro, NJ, “including high levels of vitamin C, high levels of positive metal ions, or using a dye in a pigment application. For anthocyanin colors—purple sweet potato, grape, red cabbage, radish, elderberry, black carrot—pH should be as low as possible, as slight increases require much more color to be used.”

Order of addition can also be a significant factor. For instance, “there are good and bad ways to add caramel color,” says Tuescher. “For example, if you are using flour, if you first mix the color and the flour, you get better distribution, so you are using your colors more effectively.”

Another issue is flavor, particularly in colors derived from natural sources—just think of the spice and colorant turmeric, although deflavored versions are available. Even caramel color requires caution, says Tuescher, with “some very mild and others with a significant flavor contribution. It depends on the classification of caramel color you are using.”

Policy Statement – Color Compendium

The FDA defines a color additive in Title 21 Code of Federal Regulations (CFR) Part 70 as any “that is a dye, pigment, or other substance made by a process of synthesis or similar artifice, or extracted, isolated, or otherwise derived, with or without intermediate or final change of identity, from a vegetable, animal, mineral, or other source” that, when added to a food, imparts a color. Colorants are generally divided into two categories, commonly known as artificial and natural, and legally called “certifiable” or “exempt from certification” respectively.

Certified (21 CFR Part 74 Subpart A) colors approved for general U.S. food use include: FD&C Blue Nos. 1 and 2, FD&C Green No. 3, FD&C Red Nos. 3 and 40, and FD&C Yellow Nos. 5 and 6. Orange B and Citrus Red No. 2 are restricted to specific uses. FD&C colors are available as water-soluble dyes and water-insoluble lakes (dyes extended on an aluminum hydrate substrate).

Exempt (21 CFR Part 73 Subpart A), or natural, colors include pigments derived from natural sources such as plants, minerals or animals, and manmade counterparts of natural derivatives. These include common coloring agents: annatto extract, beta-carotene, beet powder, canthaxanthin, caramel color, carrot oil, cochineal extract (carmine); cottonseed flour, toasted, partially defatted, cooked; and fruit juice, paprika, paprika oleoresin, riboflavin, saffron, turmeric, turmeric oleoresin, and vegetable juice. B-apo-8'-carotenal, ferrous gluconate, grape color extract, grape skin extract (enocianina), and titanium dioxide are restricted to specific uses.

Show me the money

Ingredient cost, specifically the actual cost-in-use, is key. “A color blend that is three to four times more expensive than another could still have a final cost-in-use that is smaller than the less costly

blend,” notes Madkins. He also points out that “high-performance” ingredients, such as microencapsulated colors, may be slightly more costly than simpler color systems, but may provide improved performance and stability in the finished product.

“For applications where either a powder or liquid can be used, often powders are selected instead of liquid systems,” Madkins explains. “The thought is that powders are cheaper, bulk, even commodity items.” However, while liquid systems or predispersed color systems (dispersions) of the powders may increase the formulation cost-in-use slightly, he says manufacturers can obtain savings in several areas: They may be less messy, which results in a cleaner plant facility and reduced cleanup time. They may ease mixing in the finished product. And they can improve batch-to-batch consistency, which “will dramatically outweigh using the lower-cost powders, longer-term,” he says.

Replacing more-expensive ingredients is de rigueur for colors. Using caramel color is a standard technique when the cost of cocoa rises, says Terry Geerts, application chemist, Sethness. The actual use rate depends on the product, as, for instance, “it’s much easier to do in a mass-market cookie than a high-end one,” he says. “There, you might look at a 50% (cocoa) reduction if flavor is not a factor, just color.” This technique is often used in ice cream sandwich basecakes and chocolate beverages.

Still, colors can cost-effectively enhance quality in surprising ways. Tuescher describes how adding caramel helped balance the flavor of a cappuccino product: “Taste tests showed the actual amount of coffee used was too dominating over the other flavors. Removing some of the coffee and adding caramel color gave it the dark, rich look they wanted without excess coffee flavor.”

In the end, “selecting the optimal colorant or color system for a given application, taking into account processing, ingredients and shelf life, means you will also utilize the most-suitable usage rate and not be concerned with any color loss, whether in processing or during the shelf life of the food product,” says Madkins.