



# Powering natural food color solutions





Food colors derived from nature — suitable solutions to respond to consumers demand for more natural foods



## Natural Food Colors Association (NATCOL)

NATCOL is an international non-profit organization acting on behalf of the natural food colors and coloring foods industry. Visit [www.natcol.org](http://www.natcol.org)

NATCOL was founded in 1979 and represents the international interests of companies providing natural food colors and coloring foods for the food and beverages, feed and related industries.

NATCOL promotes the use of natural colors and coloring foods worldwide. It seeks to ensure the scientific regulatory environment related to natural colors and coloring foods responds to the evolving needs of its customers and consumers.





## Introduction to food colors

Color influences consumer food preferences. The color of food is considered as the single most important product-intrinsic sensory cue when it comes to setting people's expectations regarding the likely taste and flavor of food and drink. For this reason, color has been added to food for many years.

Originally, ingredients providing color were made from existing natural sources or grown locally and used in home kitchens. The industrialization of food production drove the need for food colors that were consistent in every production batch and stable throughout shelf life of the product.

From the 1860's onwards, both naturally extracted and synthetically produced food colors were developed and put into production. Over more than a century, the increased availability of these industrial food colors resulted in the introduction of bright and intense colored food products. The regulatory frameworks including safety assessments of the food colors were introduced in the mid-1900's.

During the past 50 years, an industry focusing on natural food colors has developed, with the intent to provide natural, safe, and stable food colors.



Providing  
natural, safe  
and stable  
food colors



## Evolution of the global market

In the last century, artificial food colors were predominantly used. But for several years now, the demand for clean label products has become a leading trend, as consumers seek foods with simple, wholesome ingredients they know and trust.



Markets around the world have been influenced by a trend toward naturally-derived colors. Europe was the first region to shift drastically away from artificial food colors. Due to EU Regulatory requirements for precautionary labeling of six synthetic dyes, the EU food industry has been using natural color solutions for more than a decade.

As the food industry transitioned to natural food colors in Europe, other markets around the world were influenced by similar consumer preferences for natural ingredients.

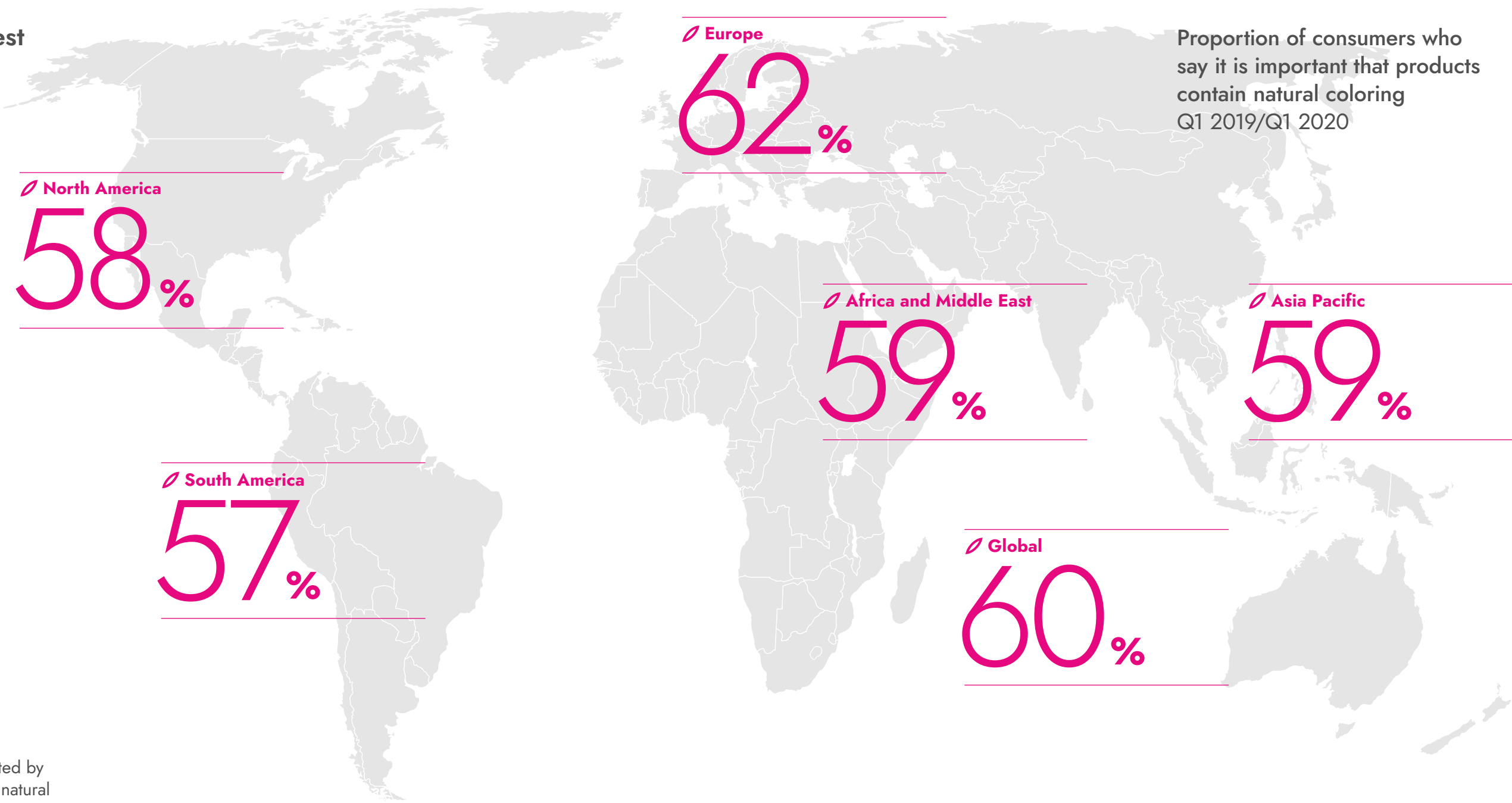
As a result, the natural food color industry, a majority of whom are NATCOL members, has responded by investing heavily in innovation, ensuring stable natural color solutions for all food categories, and working out solutions for today's global need for natural food color solutions.



The demand for  
clean label products  
has become  
a leading trend



Global consumer request for natural solutions



In a recent consumer study, conducted by FMCG Gurus, it was confirmed that natural products influence consumers purchasing decision. FMCG Gurus research from the Global Clean Label survey (2019 - 25,000 respondents) shows that 72% of consumers say that it is important or very important to them that food is 100% natural, showing a large-scale backlash against the presence of artificial ingredients.

This demand from consumers has a direct impact on Food & Beverage formulations. At a global level, 3 out of 4 new product development launches with colors contain non-artificial dyes (Mintel database).

Proportion of launches containing non-artificial colors on last 3 years 2018-2020 (Mintel database)

Global	77%
Africa and Middle East	68%
Asia Pacific	75%
Europe	94%
North America	69%
South America	59%



The natural food color regulatory landscape



Establishing simple and gentle non-selective extraction methods

The innovation in the natural food color industry has not only resulted in stable products, but also in establishing simple and gentle non-selective extraction methods. This work has resulted in the establishment of the category of “Coloring Foods”.

This means that today we have two categories of natural food colorants: **The Natural Food Colors** originate from a wide range of sources like vegetables, fruits, plants, minerals and other edible natural sources. The natural food color pigments are selectively extracted from the natural source materials and are formulated with carriers and additives to provide additional properties to the pigment such as better solubility or higher stability. The natural food color pigments are classified as additives (E-numbers/ INS -numbers), approved by Authorities and defined by regulatory specifications. In term of labelling, they are identified as color additive in the packaged goods with the mention of their name or E-number/ INS-number.

**The Coloring foods** are concentrates of traditional food sources like fruits, vegetables, flowers, spices, algae and/or other edible source materials. Coloring foods have not been obtained by a way of ‘selective extraction’, which differentiates them from food additives (colors). In the EU, Coloring Foods are declared on the ingredient list as: “Coloring food (carrot concentrate)” or “carrot concentrate”. In the US, most of these products are classified and labelled as fruit or vegetable juice color additive.

For more information on Coloring Foods, consult our [Code of Practice for the Classification, Manufacturing, Use and Labelling of Colouring Foods \(EU\)](#).

EU	US	Codex Alimentarius (International reference standards)	Other markets
Natural food colors, classified and labelled as food color additives (E-number).  Coloring Foods: classified and labelled as food ingredient and not as food additive (color).	Naturally-derived food colors, classified and labelled as food color additives exempt from certification.	Natural food colors, classified and labelled as food color additives (INS-number).	Natural food colors, classified and labelled as food color additives (E-number or INS number).  Local provisions for Coloring Foods.

For detailed regulatory references, see NATCOL website [www.natcol.org](http://www.natcol.org)











Main natural food color sources

Food color additives derived from nature are extracted and prepared from natural sources such as fruit, vegetables, plants, minerals, insects, algae and microorganisms. They offer a wide spectrum of colors.

On the right are some of the main colors derived from natural sources including the name of the natural pigments responsible of their coloring properties. Depending on the source and the extraction process applied, it will result a natural color additive or a coloring food.

More about natural colours [www.natcol.org/library/what-are-natural-food-colours/](http://www.natcol.org/library/what-are-natural-food-colours/)

Extracted from natural sources

Shade	Source	Pigment
 Green	Spinach, grass, alfalfa, nettle	Chlorophylls /Chlorophyllins
 Blue	Spirulina	Phycocyanins
 Black	Plant, peat, wood	Carbon Vegetabilis
 Red to blue	Fruits and vegetables (such as grape, purple carrot, red cabbage...)	Anthocyanins
 Red to pink	Beetroot	Betanin
 Orange to red	Cochineal	Carminic Acid
 Yellow to red	Red/orange/yellow fruits, vegetables and plants (such as orange carrot, paprika, tomato, annatto seeds...)	Carotenoids, such as Beta-Carotene, Lycopene, Bixin, Norbixin...
 Yellow	Turmeric, Safflower	Curcumin, Safflominoids
 Brown	Sugar cane	Caramel, Burnt Sugars
 White	Limestone	Calcium Carbonate



Natural colors in food applications

Why add color to food?

Color is the first characteristic that is noticed in food and can predetermine our expectations of both flavor and quality.

Color and flavor are highly linked, and it is said that we first “eat with our eyes”. Color makes products look interesting and attractive and can also help influence/support flavor perception or expectations. Think of a bag of candy where there are multiple colors. If you want the strawberry flavored gum, you will automatically take the red piece.

In food manufacturing, colors are added to food and beverages for several reasons:

01

To restore the original appearance of food whose color has been affected by processing, storage, etc. An example is fruit in fruit preparations that has lost some of its original color during processing with heat.

02

To ensure uniformity of colour in food from batch to batch – e.g. if raw materials of a food product are subject to seasonal variations, the addition of color permits the final food product to have a consistent appearance.

03

To give color to foods which would otherwise be colorless. This could be beverages, ice cream, and confectionery products. Color is added both to make the products visually more attractive but also to guide the flavor direction. E.g. an orange soft drink is likely expected to have an orange or tangerine flavor rather than a lemon or lime flavor.

04

To reinforce colors already present in food but less intense than the consumer would expect – this can also help emphasize the flavor of the product and make products more visually attractive.

Alternative to artificial dyes

Natural colors can be used as alternatives to artificial food dyes.

Natural color additives	Coloring foods	Artificial colors
Chlorophyll(in), Copper chlorophyll(in)	Blends (spirulina/safflower,...)	Blends
	Spirulina extract	Brilliant blue E133 (FD&C Blue No.1)
Carmine, Anthocyanins, Betanin, Lycopene	Red fruit & vegetable concentrates (beetroot, purple carrot, radish, elderberry, blackcurrant, tomato,...)	Red Allura E129 (FD&C Red No.40)
B-carotene, Annatto, Paprika	Carrot concentrate, paprika concentrate, blends...	Sunset Yellow E110 (FD&C Yellow No.6)
Turmeric, B-carotene, Lutein	Safflower, turmeric, carrot or pumpkin concentrates...	Tartrazine E102 (FD&C Yellow No.5)

Color can predetermine our expectations of both flavor and quality

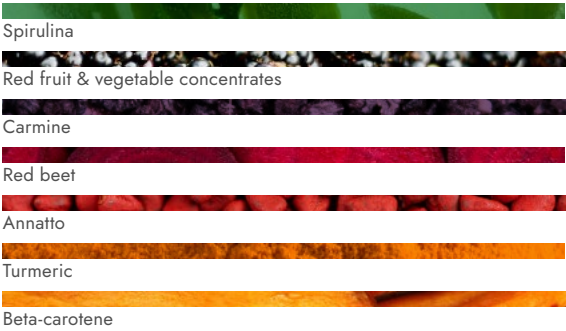




Frozen treats

A rainbow of colors can be obtained in ice cream, sorbets, and popsicles. There are several points of attention when using natural colors during the manufacturing process of ice cream: pH of the base, heating and pasteurization, homogenization and aeration.

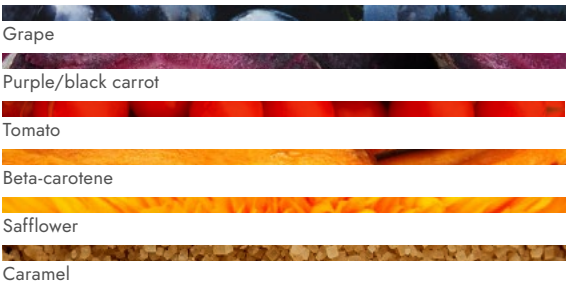
Two of the most popular flavors of ice cream are vanilla and strawberry. Vanilla ice cream is often colored with annatto, turmeric or carotenoids, while strawberry ice cream often contains carmine or red beet.



Beverages

Colors are key ingredients in flavored drinks and other beverages. Their shade and intensity provide information to consumers about the taste and freshness. One of the main challenges is color stability during processing and throughout product shelf life. Many factors can affect the color of the beverage and must be considered when selecting suitable colors. As beverages vary greatly in terms of their matrix, ingredients and pH, as well as exposure to heat, light and oxygen, the color supplier can advise the most suitable option for selection.

Currently, the colors derived from nature used most frequently in beverages are caramel colors, carotenoids, anthocyanins or fruit and vegetable concentrates (grape, purple/black carrot, purple sweet potato) or lycopene. Other solutions can also be used to provide a larger color palette or to adhere to specific labeling requirements.



Breakfast cereals and snacks

Historically, cereal has enjoyed a beneficial health halo. With the demand for more natural foods, the food industry is innovating to align with the consumer view of wellness in the cereal aisle. A wide range of naturally sourced colors can be used—generally, yellow, orange, red, and brown colors are most desired.

In snack seasonings, fortification with antioxidants will help to extend shelf life and keep the vibrant orange of paprika or annatto colors. In breakfast cereals, the palette is extended to pink and purple using fruit & vegetable concentrates.

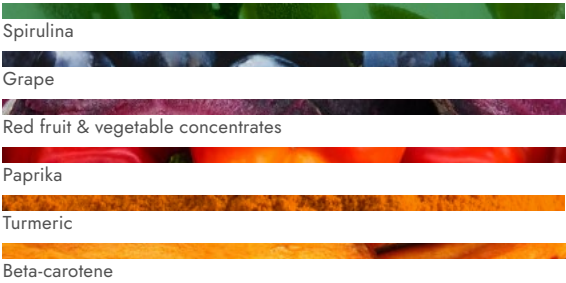




Confectionery

Most confections use colorless ingredients such as sugar or pectin. Therefore the addition of color is often necessary to give an indication of the taste of the sweets and to make them appealing. Depending on the confectionery category, different color performances are required such as intense colors, stability to low pH or heat, water or oil-solubility. For all of these, the stability of the color during the long ambient shelf life is a key criterion and is achievable with the current naturally-derived color solutions on the market.

These products require a large diversity of color shades as the market demands several varieties of flavored and colored candies, often presented under a products assortment.



Savory and plant-based meat alternatives

Savory applications are a daily part of our diets and often rely on naturally-derived colors to provide their appetizing appearances. Given the diversity of savory foods, many different product formulations exist to achieve optimal performance across all product lines within this group.

Currently, the most demanding applications are meat alternatives. They require colors from plant-based sources that mimic the real meat products with all the guarantees of a vegan food.



Dairy products



In fermented dairy such as yogurt and cheese, colors derived from nature are widely used. The most popular flavor in fermented dairy around the world is strawberry. Strawberry yogurts can be colored with carmine, red beet, purple/black carrot or other sources of anthocyanins.

Cheeses such as cheddar have been colored with annatto more than a century.






With the use of today's technologies and extensive knowledge about natural color sources and pigments, it is possible to use natural colors for all food applications.

The NATCOL member companies are able and eager to help food manufacturers in finding exactly the right natural color solution for their products and to meet the consumer request for natural food. This goes for both new food applications, and for natural color solutions in existing food products.

The information contained in this document is believed to be true and accurate. As such this document is not, and should not be construed as, a guarantee or warranty, nor a part of any contractual of other legal obligations on behalf of NATCOL and its member companies. This information is offered solely for the consideration, investigation and verification of interested parties.

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use natural colors  
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