



Looking good. Being good.

Natural colors that won't let you down

A white paper by Lycored



Natural is the new standard

Clean label has established itself as the new standard in the food industry. Consumers are demanding shorter and more recognizable ingredient lists, and manufacturers are responding by increasingly highlighting the naturalness and origins of their products.

In 2014 there were 9,301 launches of products with an 'all-natural' proposition worldwide, according to Mintel's Global New Products Database – 13% more than in 2013 and a massive 58.5% increase over 2012.

The trend towards clean labels is clear – and in turn this means natural colors are now an essential component of food and beverage products. Continued use of artificial colors risks alienating consumers and turning them on to alternative products that have already embraced the natural trend.

Nevertheless, it's also true that natural colors can be more difficult to work with than their artificial counterparts. In particular, they tend to be less stable in the face of everyday environmental and processing conditions such as UV light, pH and extreme temperatures.

Lycored's Tomat-O-Red® and Lyc-O-Beta® natural red, pink, orange and yellow colors overcome all the common stability issues associated with these factors, ensuring products don't just look good, but are good too.



Authentic, stable and consistent

Manufacturers using Tomat-O-Red® and Lyc-O-Beta® can be confident of achieving an authentic, shelf-stable and consistent appearance for their products every time. They can also be assured that Lycored's production and supply process is safe, sustainable and fully traceable, from the raw material to the finished formulation.

Tomat-O-Red® is a range of lycopene-based pink to red colors derived from tomatoes grown on farms in Israel and California. It is a good alternative to more sensitive natural red colors such as beetroot and anthocyanins, as well as carmine, which is not vegetarian-friendly. For manufacturers looking to make the switch from artificial, the Tomat-O-Red® range is a good alternative to synthetic variants such as Allura Red (Red 40) and Red 3. It is perfect for use in fruit preparations, dairy products, meat, baked goods and beverages.

Lyc-O-Beta® is sourced from *Blakeslea trispora*, a beta-carotene-rich, allergen-free natural fungus cultivated under carefully controlled conditions. Beta-carotene extracted from *Blakeslea trispora* offers a spectrum of yellow-to-orange shades for use in bakery, fillings, confectionery, dairy and beverages, where it provides an alternative to artificial colors such as sunset yellow (yellow 6) and tartrazine (yellow 5).

Tomat-O-Red® can be declared simply as 'lycopene from red tomatoes', while Lyc-O-Beta® can be listed as 'beta-carotene', which many consumers will recognize as a healthy, natural precursor to Vitamin A. This means these natural colors can help companies achieve much sought-after clean label status.

Both color ranges are available in liquid form and Lyc-O-Beta® is also available as a water-soluble powder. They are approved for use as food colorants in the EU, US, Japan and Australia. They are also certified Kosher and Halal, non-GMO and vegan.



Unrivaled technical performance

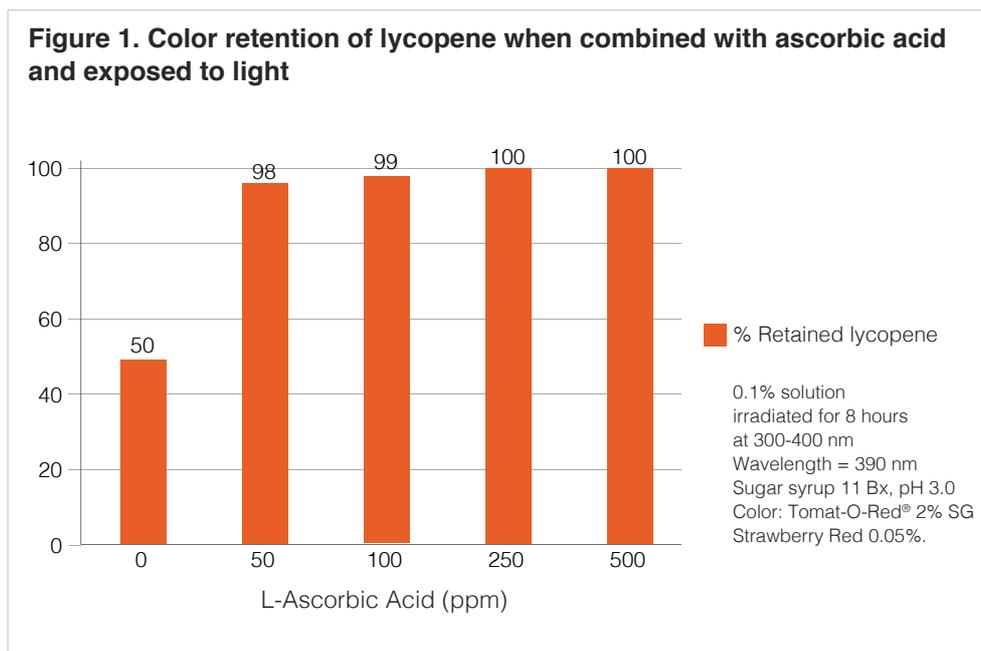
At Lycored we have channeled our in-house technical excellence to develop natural color solutions that offer unrivaled technical performance. Twenty years ago, we pioneered the extraction of lycopene from our own specially bred, non-GMO tomatoes. Since then we have developed a portfolio of technologies, formats, delivery systems and synergistic colors from natural sources that optimize the appearance of a wide range of food and drink applications.

Today we offer a range of concentrations and formats to maximize the solubility of our natural colors in food and drink matrices. In powdered formats, for instance, the particle size is carefully tailored to achieve optimum dispersion and the desired effect, whether cloudy or clear. By combining Tomat-O-Red® reds with Lyc-O-Beta® yellows and oranges, we can create unique, customized natural shades, delivering the ideal color for each customer's application.

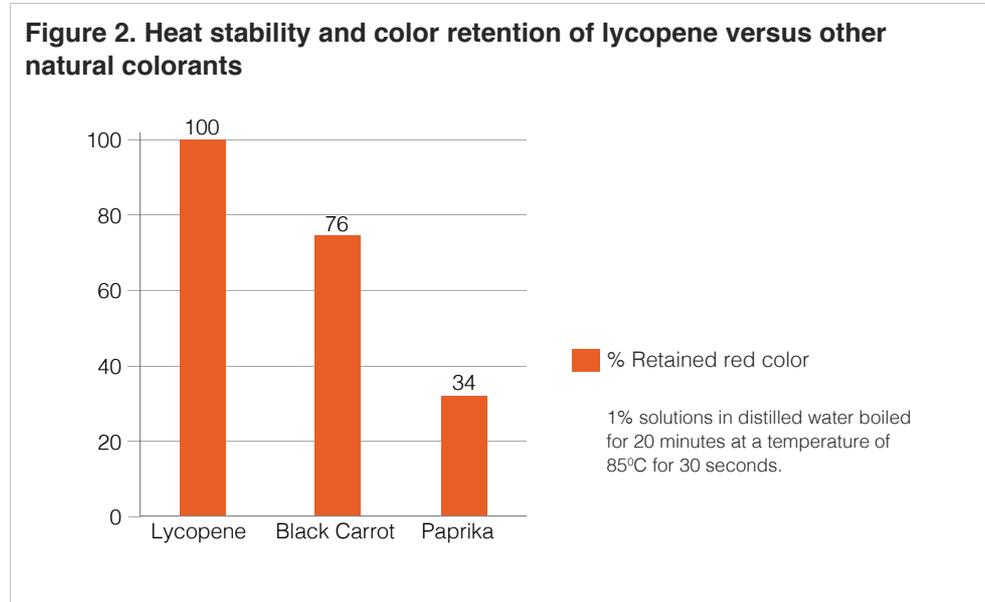
There are significant technical differences between Tomat-O-Red® and Lyc-O-Beta® and other natural colors, as follows:

Vitamin C – Vitamin C (ascorbic acid) is often used in natural formulations as an antioxidant. It is also commonly included in fortified recipes for nutritional reasons. Some natural colors will react adversely to vitamin C. However, the presence of vitamin C at typical levels – between 200 and 400 milligrams per litre in a soft drink – actually enhances the vibrancy of colors formulated using Tomat-O-Red® and Lyc-O-Beta®. Both colors also remain stable in formulations with a wide range of other vitamins and minerals, making them ideal for products such as fortified beverages.

UV light – Formulating products with Tomat-O-Red® and Lyc-O-Beta® in combination with ascorbic acid also ensures they retain their brightness on store shelves, even with high exposure to light. This is in marked contrast to colors based on beetroot or turmeric, for example. Figure 1 demonstrates the enhanced color stability of Tomat-O-Red® when combined with ascorbic acid and exposed to light.



Extreme temperatures – Tomat-O-Red® and Lyc-O-Beta® remain vibrant for longer than other natural colors, even when subjected to extreme temperatures. This means they can be used with confidence in formulations that require cooking or pasteurization – unlike colors based on beetroot and anthocyanins, for example. They also remain stable when subjected to cycles of freezing and thawing. Figure 2 illustrates the heat stability of lycopene in comparison with other natural red colors.



pH – Colors based on Tomat-O-Red® and Lyc-O-Beta® are unaffected by pH, unlike other commonly used natural colors. For instance, beetroot is unstable at certain pH values and anthocyanins will only remain red at a pH below 4. Carmine, meanwhile, will precipitate if the pH drops too far.

Low migration – A wide variety of food products feature visually distinct components, such as white yogurts with a fruity layer or cured meats with inclusions of white fat. With Tomat-O-Red® and Lyc-O-Beta® the visual impact of this structure remains undiminished throughout the shelf life of the product because the colors will not ‘bleed’ into the white mass of the product. In tests on multi-layered desserts, for instance, there was no visible migration after 40 days.

Figure 3. The Lycored colors range: a comparison

	Plant/fungi sourced	Stability to heat, light and wide pH	Stability to Vitamin C	Allergen Free	Kosher & Halal	Vegetarian	Water Dispersible	Oil Soluble	No off flavor
Beetroot	Y	N	N	Y	Y	Y	Y	N	N
Anthocyanins	Y	N	N	Y	Y	Y	Y	N	N
Carmine	N	N	Y	N	N	N	Y	Y	Y
Tomat-O-Red® water soluble Line	Y	Y	Y	Y	Y	Y	Y	N	Y
Tomato-O-Red® 2% R	Y	Y	Y	Y	Y	Y	N	N	Y
Lyc-O-Beta® water soluble Line	Y	Y	Y	Y	Y	Y	Y	N	Y
Lyc-O-Beta® oil soluble Line	Y	Y	Y	Y	Y	Y	N	Y	Y

A recipe for versatility

Tomat-O-Red® and Lyc-O-Beta® offer specific benefits to both manufacturers and consumers across a range of product applications. In beverages, for example, they are light-stable and stable alongside added healthy ingredients such as vitamin C. Their performance is also independent of pH. As a result, they can contribute to a full 12 months of shelf life without any unsightly 'ringing', which can be caused when colors start to separate from the main body of the drink.

Our natural colors are also perfect for dairy products because they remain stable during pasteurization and most UHT processes. At the other end of the temperature scale they also withstand the freeze/thaw cycle, so they are suitable for ice cream. When used in fruit preparations in combination with yogurts they will not bleed into the white mass.

In confectionery, our colors offer a natural option that appeals strongly to parents who are looking to prioritize food safety for their children. Our colors are also visually appealing. They are available in an easy-to-use liquid form for sugar syrups and do not need a long heating or dissolving stage. They have no negative impact on the crispiness of coated candies.

Meat producers in the USA can now also use Tomat-O-Red® to enhance the appearance of their products. The US Department of Agriculture announced in 2014 that it had approved a five-fold increase in the level of tomato lycopene allowed as a colorant in ready-to-eat meat products. This means tomato-based lycopene colorants are now an excellent replacement for FD&C Red #40 and carmine in a wide assortment of deli meats, sausages and hot dogs.

Figure 4. Lycored colors: formats and applications

Tomat-O-Red® (Lycopene)			
Product Name	Hue	Format	Applications
Tomat-O-Red® 2% RP	Red / Blue-ish Notes	Liquid	Beverages, Dairy, Ice Cream, Fruit Preparations
Tomat-O-Red® 2% NG NS	Red with Orange Notes	Liquid	Beverages, Dairy, Toppings/Fillings, Soups/Sauces
Tomat-O-Red® 2% R	Red	Liquid	High Fat Content (Meats) Gravies, Soups/Sauces
Tomat-O-Red® 2% FP	Red (Strawberry)	Liquid	Fruit Preparations
Tomat-O-Red® 2% S	Red	Liquid	Confectionery
Tomat-O-Red® 1% Clear Emulsion	Orange Red	Liquid	Clear Applications Waters, Hard Candy/Jelly
Lyc-O-Beta® (Beta-Carotene)			
Product Name	Hue	Format	Applications
Lyc-O-Beta® 1% CWS	Yellow	Powder	All Instant Products Cake Mixes/Custard
Lyc-O-Beta® 3% Clear Emulsion	Crystal Clear Yellow	Liquid	Clear Applications Waters, Hard Candy/Jelly, Beverages
Lyc-O-Beta® 2% NG NS	Orange Red	Liquid	Dairy, Fruit Preparations, Beverages
Lyc-O-Beta® Intense	Custom Shades Yellow to Orange	Liquid	Beverages, Hard Cheeses
Lyc-O-Beta® 5% F Emulsion	Yellow	Liquid	Fruit Preparations, Confectionery Dairy/Ice Cream, Creams/Fillings
Lyc-O-Beta® 1.3%	Yellow	Liquid	Hard Cheeses, Beverages, Concentrates
Lyc-O-Beta® 30%	Yellow to Orange	Liquid	Margarine & Butter Spreads
Lyc-O-Beta® 2% S	Orange	Liquid	Confectionery

Natural nutrition consumers can trust

Committed to 'Cultivating Wellness', Lycored is an international company at the forefront of unearthing and combining nature's nutrition potential with cutting edge science to develop natural ingredients and products that consumers can trust. Established in 1995, We are the global leader in natural carotenoids for food, beverage and dietary supplement products. We develop and supply natural ingredient formulations in four main business areas: active health ingredients for wellness; colorings; ingredients for taste & texture improvement; and nutrient premixes for fortification. Lycored is based in Israel, with sales & production operations in the UK, Switzerland, the US, Ukraine and China.

For more information about our natural colors please contact kimberly.vitale@lycored.com or visit lycored.com

Tomat-O-Red® and Lyc-O-Beta® – key benefits at a glance

- ✓ Safe and traceable, thanks to Lycored's vertical integration from farm to formulation
- ✓ Clean label, with nothing artificial
- ✓ Natural and clean, non-GMO and free from dichloromethane
- ✓ Easy to use in aqueous and oil-based formulations
- ✓ Excellent appearance for longer, with superior stability to UV, pH and added vitamins
- ✓ Maintenance of high quality, with no migration, no off-tastes and no impact on texture throughout a product's shelf life
- ✓ Able to withstand extreme temperatures, such as UHT, pasteurization, freeze/thaw and cooking
- ✓ Economical cost-in-use
- ✓ Vegan, kosher, halal and allergen-free

