



KEY CHALLENGES

- Yeasts, Molds TPC Inhibition;
- Increases Anthocyanin (color) stability;
- Maintain freshness and authentic appeal;
- Cost effective, Shelf-life extension;
- Clean Label;

NATURAL ANTIMICROBIAL AND COLOR STABILIZER IN BEVERAGES

As consumers become more conscious about the ingredients in their food and drinks, there is a growing demand for natural and sustainable products, leading to a rejection of synthetic preservatives. In fact, a report by a global consumer trend forecasting company has found that the new generation of consumers are seeking clean, sustainable, and socially responsible beverage brands to quench their thirst.

To meet this demand, new ways of preserving beverages naturally have emerged. Handary, a company specializing in natural food protection solutions, has discovered that plant-based products offer the potential to extend the shelf-life of beverages without affecting their flavor, color, or aroma. Handary's solutions also help improve the microbial stability of beverages during and after production.

Some popular beverages as Fruit Juices, Water Flavored drinks or Fruit Seed Syrup are now available in different flavor and texture. However, these types of applications often encounter problems with yeast, molds, and bacteria.

To address this issue, Handary has developed a complete solution using **Fixolor® AT** and **Planteria® RF**, which work synergistically with the formulation to safely extend the shelf-life of the final tea product, while preserving its quality and taste.

APPLICATIONS

OUR NATURAL SOLUTIONS

- Planteria™ RF Berry Extracts
- Fixolor™ AT Cultured SugarCane

Fruit Juices
& smoothies



Water Flavored
Drink



Fruit Seed
Khak e Shir



BEVERAGES

Yeast & Molds in Beverages

Yeast and mold are types of microorganisms which can be found in various environments, including beverages, their presence is considered undesirable. In the case of beverages such as fruit juices, soft drinks, or other non-alcoholic beverages, yeast and mold can be a sign of contamination or improper storage conditions. When exposed to air and moisture, these microorganisms can multiply and cause changes in the flavor, texture, and appearance of the beverage.

Yeast is a type of fungus which can ferment sugars into alcohol and carbon dioxide, it can also cause fermentation in non-alcoholic drinks, leading to off-flavors, carbonation, and possible bottle or container swelling due to the production of gas.

Molds, on the other hand, are a broader group of fungi which can grow on various substrates, including beverages. They can appear as visible growth in the form of spores, which are tiny, microscopic particles. Molds can produce unpleasant flavors, odors, and can pose health risks, especially if certain toxic molds are present.

Enzymatic Browning in Beverages

Enzymatic browning is a natural chemical reaction which occurs when enzymes, such as polyphenol oxidase, come into contact with oxygen in the presence of certain compounds called phenols. This reaction results in the browning or darkening of certain beverages that contain enzymatic browning-prone ingredients. For example, juices or beverages made from fruits like apples, pears, or bananas may undergo enzymatic browning when exposed to air.

Enzymatic browning in beverages can lead to changes in color, flavor, and overall quality. The browning pigments that form during the reaction can produce undesirable flavors and alter the appearance of the beverage, making it less appealing to consumers.

Fixolor® AT and Planteria® RF The perfect combination for Beverages

Fixolor® AT is a kind of natural cultured sugarcane fermented by using the bacterium strain *Lactobacillus* sp., which is used to extend drink shelf life by increasing anthocyanin (color) stability and providing multi-barrier against bacteria, Yeasts and Molds.

Plantéria® RF is group of berry extracts carried by tapioca maltodextrin rich in naturally acquired sorbic acid. Efficient against Yeasts and Molds inhibition, with an added value for its high solubility it's the perfect clean label solution in several beverages applications.

By using **Fixolor® AT** and **Plantéria® RF** in combination, which work synergistically with the formulation, it will offer a complete solutions to safely extend the shelf-life of the beverages, while preserving quality and taste.

Gram positive Bacteria in Beverages

Gram-positive bacteria retain the crystal violet dye during the Gram staining procedure, appearing purple under a microscope and their presence in beverages is generally considered undesirable.

In the case of non-fermented beverages like fruit juices, soft drinks, or water based drinks, the presence of gram-positive bacteria can indicate contamination and potential spoilage.

Some common examples of gram-positive bacteria that may be found in beverages include species of *Bacillus*, *Clostridium*, *Staphylococcus*, and *Streptococcus*.

These bacteria can enter beverages through various sources, such as raw ingredients, water, or unsanitary processing environments. Factors like inadequate pasteurization, improper storage conditions, or extended shelf life can promote the growth of gram-positive bacteria in beverages. Their in beverages can lead to spoilage, off-flavors, and possible health risks if harmful strains are present.



BEVERAGES

Fig 1. Planteria® RF in Fruit Juices

Fruit juices are defined as “the fermentable but unfermented product obtained from the edible part of the fruit which is sound and ripe, fresh or preserved by chilling or freezing of one or more kinds mixed having the characteristic color, flavor and taste typical of the juice of the fruit from which it comes».

These products can suffer microbiological spoilage, which is one of the main concerns for the fruit juice industry. Spoilage may occur from bacteria, yeasts, and molds.

Fruit juice application was investigated and have been stored at a refrigerated temperature for the entire experiment. As seen in the graph Sodium benzoate 150mg/L treatments and the negative control were already spoiled by the 7th day of the experiment. **Planteria® RF** 0.3% treatment showed great results against Yeast and Molds as it remained unspoiled through the 18 days of study.

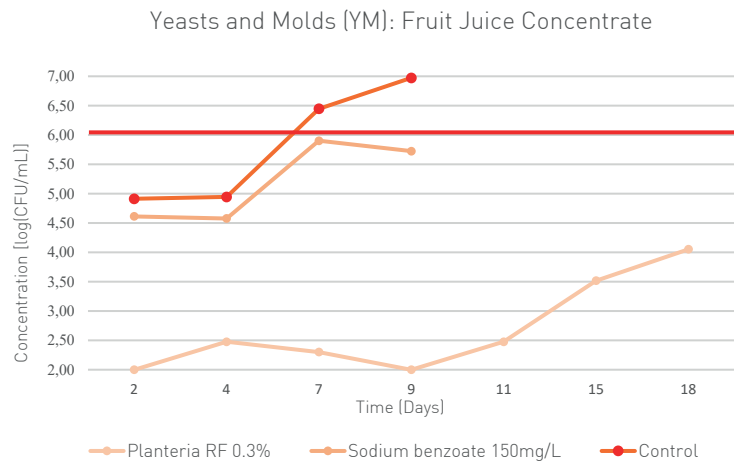
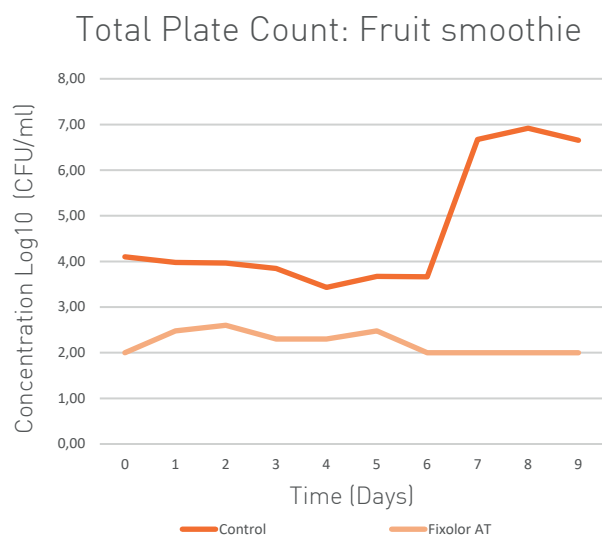


Fig 2. Fixolor® AT in Fruit smoothies

The shelf life of fruit smoothies is mainly limited by anthocyanins, which cause the colour of the product to fade in a short period of time. In addition, spoilage bacteria, such as *Lactobacillus* spp. Cause unpleasant tastes and odours and gases.

Experimental studies show that there was visible difference in the color of the smoothies added with **Fixolor® AT** since day 1 and the also until the end of the shelf-life at day 19 when actually compared to control did not give such customer appeal.

The graph also shows that the difference in the microbial load of the fruit smoothie between control and treated samples (1% **Fixolor® AT** and 0.1% Sodium benzoate at 4°C in the refrigerator). This study demonstrates that Fixolor AT inhibits the Total Plate Count growth up to 9 days whilst maintaining the color.



BEVERAGES

Fig 3. Planteria® RF and Fixolor® AT in Peach Tea

Bacteria, such as *Alicyclobacillus acidoterrestris*, can thrive in environments with high water activity and a broad temperature range of 20 to 70°C, even with restricted oxygen supply (pH 3.5–4.5; temperature 35–53°C). This type of microbe can also grow in products such as peach tea, where it may not produce gas, making spoilage difficult to detect until the end of the food chain. This can result in consumer complaints, product withdrawal, and economic loss.

During the experiment, microbial analysis was conducted for Total Plate Count and yeast and molds, which showed minimal to no detection of both bacteria and fungi. This indicates that the use of **Fixolor® AT** and **Planteria® RF** in iced peach tea effectively inhibited the growth of these microorganisms.

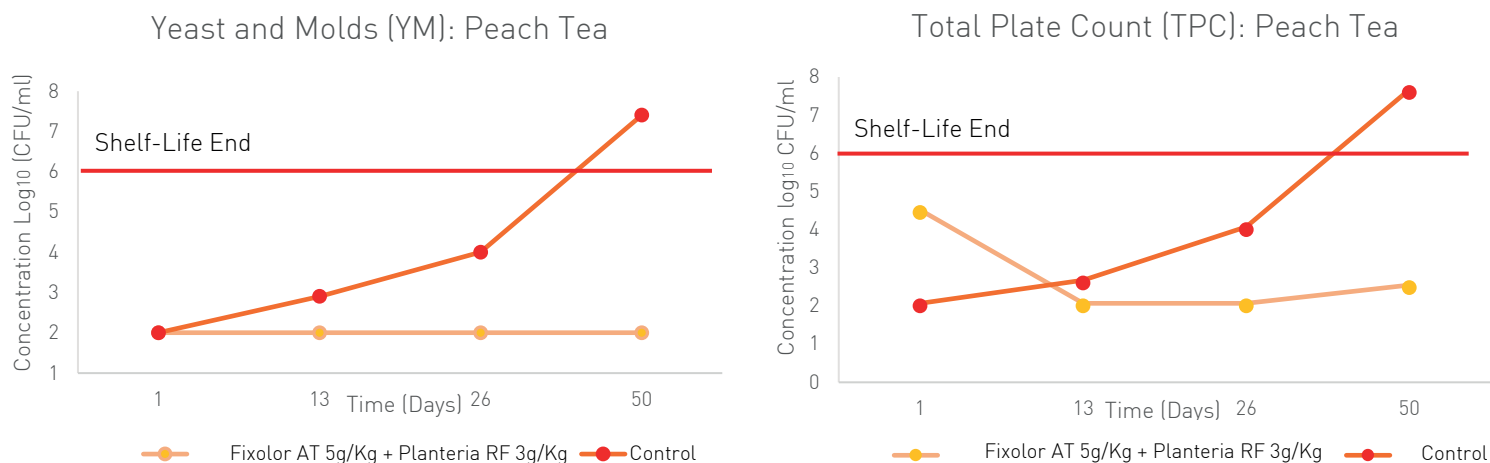


Fig 4. Planteria® RF and Fixolor® AT in Fruit Seed Khak e shir

Fruit Seed Khak e Shir is a powerhouse of nutrients, making it ideal for consumption after waking up in the morning or in any time of the day. This is a beverage made by combining flaxseeds and cinnamon with water or another liquid base.

Flavored seed Syrup can indeed have spoilage issues if not stored properly or if it is consumed beyond its recommended shelf life. If the drink is not prepared or stored in a clean and hygienic environment, it can be prone to bacterial contamination. This can lead to spoilage and the growth of harmful bacteria that can cause foodborne illnesses.

The combination of **Fixolor® AT** and **Planteria® RF** in Flaxseed cinnamon drink to extend the shelf life of this drink. The addition of 2 g/kg **Planteria® RF** and 0.5% **Fixolor® AT** gave excellent results against mould and contributed to colour stabilisation.

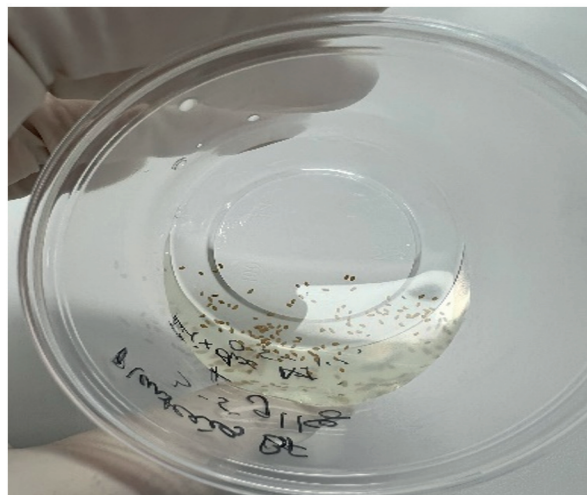


Table. Natural Solutions in Beverages

Applications		Benefits	Solutions	Dosages
Beverages	Fruit Juice & Smoothies	Growth control and stability of Yeasts & Molds	Planteria® RF	2.5-5 g/kg
		Growth control of TPC (Total Plate Count) and color Stability	Fixolor® AT	0.5-1% (w/w)
	Water Flavored Drinks	Growth control and stability of Yeasts & Molds	Planteria® RF	2.5-5 g/kg
		Growth control of TPC (Total Plate Count) and color Stability	Fixolor® AT	0.1-0.7% (w/w)
	Flavored Seed Syrup Khak-e-Shir	Growth control and stability of Yeasts & Molds	Planteria® RF	2-5 g/kg
		Growth control of TPC (Total Plate Count) and color Stability	Fixolor® AT	0.5-1% (w/w)