Jungbunzlauer

From nature to ingredients®

CITROFOL®

Citrate esters – bio-based and versatile

CITROFOL®

Citrate esters – bio-based and versatile

CITROFOL® is Jungbunzlauer's globally recognised brand of citrate esters. Worldwide, Jungbunzlauer is one of the largest producers of citric acid and citrate esters. Product innovation and continuous process improvements in our state-of-the-art plants result in unique, high-quality products.

Our CITROFOL® citrate esters are safe and environmentally friendly. According to EU GHS (Globally Harmonized System) they are non-hazardous substances. The Jungbunzlauer citrate esters are USDA Certified Biobased according to the USDA BioPreferred® Program and they are suitable to be used in bio-based applications in designated categories. Futhermore, they are listed in international chemical inventories such as REACH. Moreover, all CITROFOL® esters are non-GMO, vegan, kosher and halal.

Citrate esters are produced by acidic esterification of citric acid and either ethanol or n-butanol. A further acetylation step can lead to other esters. CITROFOL® types are clear, colourless and odourless liquids. They are non-VOCs (volatile organic compounds) with excellent storage stability. They are therefore the preferred choice for sensitive products like toys, food packaging, medical devices, pharmaceutical applications and personal care.

Sustainability

Sustainability is a keystone of Jungbunzlauer's strategy and value proposition. Jungbunzlauer ingredients are manufactured through natural fermentation from renewable raw materials. With a long history of calculating carbon footprints and implementing sustainability initiatives, Jungbunzlauer has set ambitious emission reduction targets and committed to the SBTi (Science Based Targets initiative) in 2021. This includes measuring environmental parameters such as greenhouse gas emissions and water consumption, which are also disclosed in the annual sustainability report.

Consistent with our vision From nature to ingredients® we are dedicated to providing products and services with an emphasis on high quality, reliability and environmental awareness. Being bio-based and biodegradable, CITROFOL® esters provide an excellent replacement for a wide range of synthetic and potentially harmful ingredients in diverse applications. Especially in sensitive applications like medical devices, toys or (natural) cosmetics CITROFOL® esters have a long history of safe use as substitutes for phthalates, for example.

Ethanol-based citrate esters

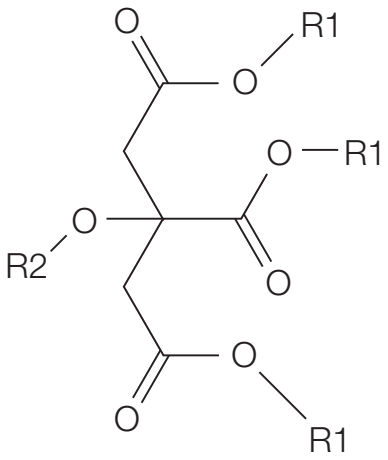
The ethanol esters CITROFOL® AI (triethyl citrate) and CITROFOL® AII (triethyl O-acetylcitrate) are bio-based ingredients that can be used in a wide range of applications. Due to their outstanding properties and pharmacological as well as ecological safety, they are generally used in the pharmaceutical, food, personal care and polymer sectors.

CITROFOL® AI

CITROFOL® AI is manufactured by esterification of citric acid and ethanol – both produced by fermentation – and is therefore 100% bio-based. It is slightly soluble in water (up to 5%) and miscible with ethanol and ether. It is not a skin irritant and shows no sensitising effects on humans.

CITROFOL® AII

CITROFOL® AII is produced by acidic esterification of citric acid and ethanol followed by an acetylation process. CITROFOL® AII is insoluble in water but freely soluble in ethanol, isopropyl alcohol, acetone and toluene.



	R1	R2
CITROFOL® AI	Ethyl	H
CITROFOL® AII	Ethyl	Acetyl
CITROFOL® BI	Butyl	H
CITROFOL® BII	Butyl	Acetyl

Butanol-based citrate esters

Butanol-based citrate esters are versatile ingredients characterised by preferable toxicological and eco-toxicological profiles. They represent a useful alternative to petrochemical-based systems like phthalates, benzoates or adipates. Both CITROFOL® BI (tributyl citrate) and BII (tributyl O-acetylcitrate) show excellent compatibility with numerous polymers and have been used in sensitive applications like medical devices, food packaging and toys for decades.

CITROFOL® BI

CITROFOL® BI is produced by acidic esterification of citric acid and n-butanol. It is a plasticiser with excellent fast-fusing behaviour, which helps to improve mechanical properties during short curing cycles or at reduced temperatures.

CITROFOL® BII

CITROFOL® BII is manufactured by esterification of citric acid with n-butanol, followed by an acetylation process. It is our most versatile citrate ester, primarily used as plasticiser in numerous polymers. In contrast to many plasticisers under scrutiny, CITROFOL® BII provides a safe alternative for sensitive applications, like food contact and medical devices.

The manifold applications of CITROFOL® esters

Food and beverages

As a permitted food additive (E1505), CITROFOL® AI can be used as a solvent or flavour carrier and as a flavour designer, due to its bitter taste. Additionally, it is an authorised processing aid to whip dried egg white products.

Personal Care

CITROFOL® AI is a widely known personal care ingredient with multiple properties. Especially in natural cosmetics, CITROFOL® AI is a preferred ingredient as it is approved for the use in personal care products certified according to the COSMOS and ECOCERT as well as NATRUE standard.

CITROFOL® AI is an effective ingredient in deodorants as it inhibits the enzymatic decomposition of sweat components and thus prevents body odour. As emollients in cream formulations, the CITROFOL® esters AI, BI and BII can help to soften and moisturise the skin. Additionally, CITROFOL® AI and BI can be used as effective solvents for solid UV filters in sun care applications. CITROFOL® AI is well-established as a solvent, diluent and fixative in perfumes and fragrances. In addition to its numerous benefits in cosmetic and personal care applications, CITROFOL® AI is also suitable as natural alcohol denaturant. A major application field of CITROFOL® BII is nail lacquer based on nitrocellulose, in which it functions particularly as plasticiser. CITROFOL® AII can also be used in this field due to its film-forming and plasticising properties.

Pharma

CITROFOL® AI Pharma is used as an excipient in particular in enteric coatings for controlled release tablets.
As effective plasticiser, CITROFOL® AI Pharma reduces the glass transition temperature and the minimum film forming temperature, making film coatings more flexible and facilitating the processability of the film coating. It is especially compatible with polymers like acrylates, polyvinyl acetate (PVA) or cellulose based polymers like hydroxypropylmethyl cellulose (HPMC).

CITROFOL® AI Pharma is specified to meet the requirements of the relevant pharmacopoeias Ph. Eur., USP and JPE. Additionally, it is registered as a pharmaceutical excipient in China.

Agriculture

As solvents, CITROFOL® esters support the manufacturing and application of pesticide formulations. CITROFOL® AI and BII are both FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) registered. Appropriate eco-toxicological properties paired with excellent compostability behaviour predestine CITROFOL® materials for the use in this field.

Standard and bio-based polymers

CITROFOL® BI and BII function primarily as plasticisers, contributing softness and flexibility to polymers, in particular polyvinylchloride and polyurethanes, acrylics, vinyl acetates or nitrile butadiene rubber. They are compatible with all kinds of standard plasticisers. CITROFOL® esters are already incorporated into bio-based polymers, where they have a positive impact on processing and final product properties. Examples are the use of CITROFOL® AI and AII in cellulose acetates and CITROFOL® BI and BII in nitrocellulose, polylactic acid and polyhydroxyalkanoates. As well as being compatible with various polymers, they have the benefit of being rapidly compostable, without harm to air, soil or water.

Coatings and paints

CITROFOL® types act as coalescents, enabling a homogeneous film formation. They have several advantages such as being odourless, non-VOC and causing minimal or zero emissions. Furthermore, citrate esters are compatible with a wide range of polymer dispersions, allowing formulators to design and control the finished paints and coatings with a focus on sustainability.

Legal aspects and certifications

	CITROFOL® AI	CITROFOL® AII	CITROFOL® BI	CITROFOL® BII
Chemical name	Triethyl citrate	Triethyl O-acetylcitrate	Tributyl citrate	Tributyl O-acetylcitrate
Synonym	TEC	ATEC	TBC	ATBC
CAS No.	77-93-0	77-89-4	77-94-1	77-90-7
E-No.	E1505			
FEMA	3083			3080
USDA Certified Biobased	✔	✔	✔	✔
Food contact EU – FCM No.	140			138
INCI	TRIETHYL CITRATE	ACETYL TRIETHYL CITRATE	TRIBUTYL CITRATE	ACETYL TRIBUTYL CITRATE
USP	✔	✔	✔	✔
Ph. Eur.	✔			✔

Jungbunzlauer Group

Jungbunzlauer is represented in all major markets. Our global network of sales companies and distributors covers more than 130 countries.

North America

Europe
(incl. Africa and Middle East)

Latin America

Asia & Pacific

- SALES OFFICE
- PRODUCTION SITE
- PRODUCTION SITE / SALES OFFICE
- APPLICATION TECHNOLOGY CENTER

Jungbunzlauer is a world leading producer of biodegradable ingredients of natural origin. The Swiss-based, international company's roots date back to 1867. Today, Jungbunzlauer specialises in citric acid, biogums, gluconates, lactics, specialties, special salts and sweeteners for the food, beverage, pharmaceutical and cosmetic industry as well as for various other industrial applications.

Jungbunzlauer's products are manufactured using natural fermentation processes, based on renewable raw materials.

All our products can be used, transported and disposed of in a secure and ecologically safe way. The Group operates manufacturing plants in Austria, Canada, France and Germany.

A worldwide network of sales companies and distributors with a thorough understanding of target markets and client requirements underlies Jungbunzlauer's strong market and customer focus. Committed to its rigorous quality standards, Jungbunzlauer guarantees for the excellence and sustainability of its products and services.

Headquarters **Jungbunzlauer Suisse AG**
4002 Basel · Switzerland · Phone +41 61 295 51 00 · headquarters@jungbunzlauer.com · www.jungbunzlauer.com