

Ferulic Acid synthetic

Description

Ferulic acid occurs in nature, in plants as a free acid or as ester mainly in seeds, in leaves and in barks.

Already in 1866 Ferulic Acid was isolated as a yellow lead salt from the resin of the plant *Ferula Foetida*. Later in 1925 Ferulic acid could be synthesized by the Knoevenagel condensation of Vanillin and malonic acid diethylester in the presence of secondary amines.

Ferulic acid usually exist as the trans isomer, solved in water and stored at room temperature over about two weeks slow isomerization results in a equilibrium ratio of 23 % cis and 77 % trans.

The multiactive and multifunctional effects of Ferulic acid are really of most interest.

Appearance

off-white, light yellow to light pink powder

INCI

Ferulic Acid

Registration

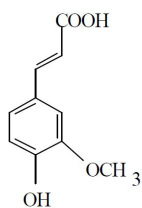
CAS-No.....1135-24-6

EINECS-No.....214-490-0

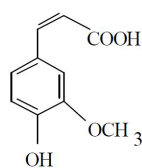
Preservatives / Stabilizers

none

Chemical Structure



trans-ferulic acid



cis-ferulic acid

Molecular formel: $C_{10}H_{10}O_4$

4-Hydroxy-3-methoxycinnamic acid

Efficacy

By objective test methods Ferulic acid could demonstrate following mode of actions:

- a sunscreen effect
- a deodorant action
- an antioxidative effectiveness
- an anti-inflammatory effectiveness

1. A sunscreen effect:

Ferulic acid and its esters like chemical sunscreen agents have a phenyl-2-propene structure that means, they have a vinylgroup at the benzene ring, which is strongly absorbing UV-light.

By this absorption the stabilized phenoxy radical will be formed and later on a cis-trans-isomerization will occur. By this mode of action ferulic acid in barks, leaves and seeds is protecting the plant from the harmful rays of sunlight.

Ferulic acid and their esters show a maximum of UV-absorption at 280nm and 340nm. By addition of 0.2 - 0.5 % Ferulic acid a sun protection factor of 3 - 5 can be achieved.

2. A deodorant effect:

Deodorants may act as antimicrobials especially against those Gram-positive germs which may decompose the sweat or they may inhibit the microbial enzymes, which are finally responsible for the decomposition of the sweat.

The minimal inhibition concentration MIC of Ferulic acid is 0.25 % for the Gram-positive germs and 0.37-0.45 % for the Gram-negative strains.

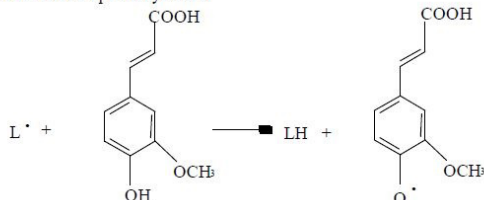
3. An antioxidative effectiveness:

An addition of Ferulic acid is able to prevent the development of radicals started by oxygen and UV-radiation. Each reactive radical Lx or L-O-O-x (lipoperoxyl radical) which might get contact with a molecule of ferulic acid abstracts a hydrogen atom from the phenolic group of ferulic acid.

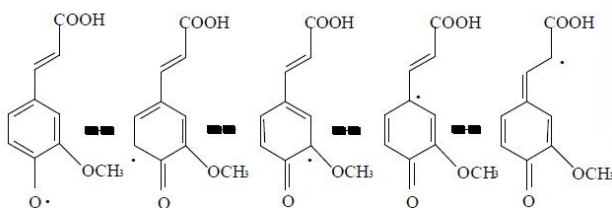
A phenoxyradical is generated, which shows a high resonance stabilization. Therefore ferulic acid is approved as an antioxidant agent in cosmetics and in food. Ferulic acid and amino acids or dipeptides form mixtures with synergistic antioxidative effects against peroxidation of unsaturated fatty acids and fats of all kind.

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a) Formation of a phenoxyradical



b) Resonanz stabilization of the phenoxyradical



4. An anti-inflammatory effectiveness

The effect of many anti-inflammatory agents is based on their influence on mediators of inflammable reactions. Oxygen radicals belong to these mediators. The anti-inflammatory effectiveness of ferulic acid is based on its antioxidative potential. It is proved by the caragenin model at the paws of rats. It is also easy to explain that Ferulic acid is able to interfere in the cycles which is responsible for forming dandruff.

The effect against itching, which is mentioned in a patent, may be explained by the anti-inflammatory effectiveness of ferulic acid.

Characteristics

assay of ferulic acid.....>= 99 %
 loss on drying.....< 0.5 %
 heavy metals.....< 10 ppm
 arsenic.....< 3 ppm
 melting point.....170°C - 175°C
 ash as Na-Sulfate.....< 0.1 %

Application

- Ferulic acid is useful as a multiactive ingredient in
- sunblock preparations
- skin care products like day creams, lipsticks, after shaves
- hair care products

Application Concentration

antioxidative effectiveness.....0.1 - 0.2 %
 sunscreen effect.....0.3 - 0.5 %

Incorporation

- 0.5 % soluble in ethanol or propylheptyl caprylate at room temperature
- 0.5 % soluble in pentylene glycol, propylene glycol or glycerine after heating (50-80°C)
- 0.2 % partly soluble in Amaranth, Sunflower oil or caprylic/capric triglycerides after heating (50-80°C)
- 0.2 % insoluble in oil at room temperature and after heating (olive, jojoba and avocado oil)
- 0.5 % insoluble in oil at room temperature and after heating (apricot kernel, amaranth and sunflower oil)
- 0.5 % insoluble at room temperature and after heating in isoamyl laurate and caprylic/capric triglycerides

The addition of solubilizer PEG-40 supports solubility in oil. Ferulic acid can be incorporated up to 80°C.

Toxicology

The toxicological and pharmacological properties of ferulic acid have been intensively studied - above all in Japan - before approval as an antioxidant agent for food.

- non hazardous in normal use concentration
- pure raw material may cause eyes or skin irritation and may cause respiratory irritation

Storage & Shelf life

Ferulic acid synthetic should be stored at 10°C - 25°C. Shelf life is two years in original closed containers.

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