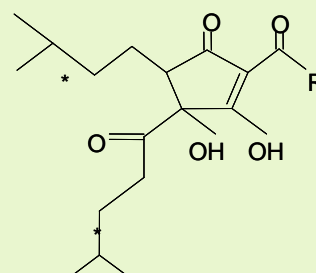


## Tetra Concentrate

### ❖ Overview

- **Tetra Concentrate** consists of purified, tetrahydroiso- $\alpha$ -acids and may be used for kettle hopping by brewers who prefer not to make post-fermentation additions to beer.
- **Tetra Concentrate** contains tetrahydroiso- $\alpha$ -acids in their potassium salt form for easier handling and dispersion in wort.
- **Tetra Concentrate** gives substantial protection against light-struck flavors when used as the sole source of hop-derived bittering.
- **Tetra Concentrate** provides enhanced foam stability when compared against other hop products used to provide bitterness.

### Structure and Properties of Tetra-Hydro-Iso- $\alpha$ -acids



\* Normal iso- $\alpha$ -acids have double bonds (-CH=CH-) at these points

### ❖ Specification

- **Description:** A brown, semi-fluid resin
- **Tetrahydroiso-alpha-acids:** Typically 65 – 70 % (w/w) by HPLC
- **Iso-alpha-acids:** < 0.5 %
- **Alpha-acids:** < 0.2 %
- **Beta-acids:** < 0.5 %
- **Hop oils:** < 1.0 %
- **Density:** Typically 1.10 – 1.14 g/ml

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## ❖ Properties

### □ Appearance

A brown resin having a slightly estery aroma and which becomes more fluid on warming.

### □ Utilization

Based on HPLC analysis, utilization of the tetrahydroiso- $\alpha$ -acids content of **Tetra Concentrate** into beer may be expected to fall in the range 25 – 35 %, though actual values will depend upon particular brewery circumstance.

### □ Light stability

**Tetra** will only provide protection from light-struck flavor in the complete absence of normal iso-alpha-acids. **Tetra** can be used in conjunction with Hopsteiner® Reduced Iso-extract to achieve light stability, improved foam and balanced bitterness.

### □ Foam enhancement

The foam head on a beer brewed with tetrahydroiso- $\alpha$ -acids to the same taste bitterness as equivalent beer brewed with hops, hop pellets or hop extracts will have a much creamier texture and a substantially enhanced stability.

### □ Bitterness

**Tetra** should provide 1.0 to 1.7 times the perceived (tasteable) bitterness as compared to the same BU level from traditional hopping. The actual figure depends on the details of its use and also on the type of beer. Therefore, the target level for beer BU must be found out in preliminary tests to achieve the correct degree of sensory bitterness.

### □ Chemical Residues

Nitrates and heavy metals are almost entirely absent from **Tetra Concentrate**. Many pesticide residues that were present on the original hops will also be essentially absent or else much reduced in relation to the bittering potential of the product.

### □ Quality

All Hopsteiner® products are produced in plants accredited to internationally accepted quality standards.

## ❖ Packaging

**Tetra Concentrate** can be packaged in cans, pails and drums according to customer requirements:

Cans: 0.5 to 4 kgs (9 lbs);  
Pails: 3 to 20 kgs (6.6 – 44 lbs);  
Drums: 50 & 200 kgs (110 – 441 lbs)

For convenience of use, customers often prefer to have their extract packed to any desired content of tetrahydroiso- $\alpha$ -acids per container (e.g. 450 g tetrahydroiso- $\alpha$ -acids per can).

## ❖ Product Use

Kettle addition of **Tetra Concentrate** may be conveniently used in the place of post-fermentation addition of **Tetra**, and especially by brewers of light-stable beers wishing to avoid the microbiological hazards of producing and fermenting unhopped worts.

### □ Dosage

Addition to the kettle should be based on the tetrahydroiso- $\alpha$ -acids concentration in the **Tetra Concentrate** and calculated on the presumption that the utilization is likely to be similar to that achieved with normal (non-isomerized) kettle hop products.

Actual utilization will depend upon particular plant and process conditions, but highest utilizations are likely if **Tetra Concentrate** is added late in the boil.

Account must also be taken of the fact that tetrahydroiso- $\alpha$ -acids can be 1.0 to 1.7 times more bitter than are normal iso- $\alpha$ -acids.

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Hence, whether measured by HPLC or BU analysis, the target for beer bitterness will need to be reduced, the appropriate value being determined through brewing trials and taste evaluation.

#### □ **Addition**

**Tetra Concentrate** may be handled like a normal CO<sub>2</sub> extract but can be added at any time during wort boiling, excepting only that the addition should normally be made no later than 10 minutes before the end of the boil.

However, like CO<sub>2</sub> Extracts, should **Tetra Concentrate** be used in automatic dosing units, it is best warmed to about 60°C (140°F) before use and then thoroughly mixed to ensure perfect dosing. Dosing pumps and lines should be flushed with warm, slightly alkaline demineralized water or ethanol to clean.

#### □ **For Light Stable Beer**

For maximum protection against “Lightstruck” flavors, it is essential to avoid inadvertent introduction of non-reduced iso- $\alpha$ -acids into the wort or beer. Therefore, be sure to:

- Avoid contamination from equipment surfaces that have been in contact with normal iso- $\alpha$ -acids.
- Never pitch wort with yeast that has been in contact with normal  $\alpha$ - and iso- $\alpha$ -acids.

#### □ **Storage**

**Tetra Concentrate** is best kept cool, in sealed containers at 10°–15°C (50°–59°F). The contents of opened containers are best used within two weeks.

#### □ **Best Before Date**

**Tetra Concentrate** is stable 2 years from date of production under the recommended storage conditions.

#### □ **Safety**

**Tetra Concentrate** is derived from a natural material and may be safely handled using routine precautions to avoid contact with skin and, particularly, eyes.

Product contacting the skin should be washed off with soap and water or proprietary hand cleansers. If **Tetra Concentrate** gets into the eyes, irrigate thoroughly with water until clear and seek medical attention.

For full safety information please see the relevant Steiner material safety data sheet.

### ❖ **Analytical Methods**

#### □ **Concentration of Tetrahydroiso- $\alpha$ -acids**

The concentration of tetrahydroiso- $\alpha$ -acids is best measured by HPLC using the current ICS standard according to the modified EBC 7.9 method. Details of recommended methods are available on request. However, where tetrahydroiso- $\alpha$ -acids are the sole source of bittering, process control may also be satisfactorily managed through BU value determination.

### ❖ **Technical Support**

We will be pleased to offer help and advice on the full range of Hopsteiner® products:

- Copies of all relevant analytical procedures
- Material Safety Data Sheets (MSDS)
- Assistance with pilot or full brewery trials
- Specialist analytical services

**Tetra Concentrate** is produced under the conditions described in Steiner’s US Patent No. 6,748,849, 7,056,549 and equivalents.

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