

Tetrahop Gold®

Tetrahop Gold® is an aqueous alkaline solution of the potassium salts of tetrahydro-iso- α -acids. It is produced from CO₂ hops extract using a patented all aqueous process. Tetrahop Gold® enhances beer foam when used as a post-fermentation replacement for a part of the normal bittering. In the absence of normal α -acids and iso- α -acids, Tetrahop Gold® will give complete protection from the formation of light-struck flavour. Furthermore, it will act as an antimicrobial agent when added to beer. Tetrahop Gold® is classified as a modified hop extract that may be safely used in beer in accordance with the US FDA regulation 21 CFR 172.560 (b) (6).

Product Specifications:

Description:	A yellow to amber colored, aqueous solution of the potassium salts of tetrahydro-iso- α -acids.
Concentration:	Standard concentration is 9.0% \pm 0.5 of tetrahydro-iso- α -acids by HPLC
pH:	8.5 – 11.0
Density:	1.017 g/mL (approximately) at 20 °C (68 °F)
Viscosity:	2 - 10 mPas at 20°C
Solubility:	Soluble in pH-adjusted de-mineralised water, and in alcohol
Iso- α -acids:	< 0.1%

Quality and Food Safety:

The Barth-Haas Group maintains quality management systems registered to the ISO 9001 standard, as well as food safety management programs based on internationally recognised (HACCP) principles. Please refer to our web site (www.barthhaasgroup.com) for more information on our systems and programs.

Product Use:

Tetrahop Gold® is normally used after fermentation and before final filtration. Utilisation of Tetrahop Gold® in final beer can be expected between 55 - 80% depending on the time and efficiency of dosing (kettle dosing is not advisable). The point of addition should be close to a region of turbulent flow, e.g. on the suction side of a centrifugal pump. The dosing pump should be adjusted to deliver Tetrahop Gold® over approximately 70% of the total transfer time. It is advisable to make the addition prior to the final filtration step. Local high concentrations of tetrahydro-iso- α -acids should be avoided and the addition point should be well separated from that of any other additives. Tetrahop Gold® may be added at ambient temperature without prior dilution directly to beer. If dilution is necessary, the use of demineralised water and a pH adjustment to 10 – 11 with KOH is necessary. Do not use sodium bases to adjust the pH of the dilution water – caustic soda or sodium hydroxide form poorly soluble salts with most hop acids.

The amount of Tetrahop Gold® is calculated based on the product concentration and the assumed utilisation. Conducting trials at the brewery will determine the correct dosage of Tetrahop Gold® with regard to sensory bitterness and foam enhancement. Depending on the

type of beer, Tetrahop Gold[®] may give 1.0-1.7 times the perceived bitterness of normal iso- α -acids. Tetrahop Gold[®] should not be left in dosing lines at low temperatures. We recommend cleaning lines and dosing pumps with warm slightly alkaline demineralised water or ethanol after use.

Usage Calculations:

The following calculations are based on the assumption of tetrahydro-iso- α -acids (THIAA) being 1.7 times as bitter as iso- α -acids (IAA). Utilisation of THIAA is expected to be up to 70 - 75% when Tetrahop Gold[®] is used as recommended.

Desired Sensory Bitterness Units = BU

$$\text{THIAA required in beer (mg/L)} = \frac{\text{BU}}{1.7}$$

$$\text{Dosage THIAA in mg/L (70\% utilisation assumed)} = \frac{\text{BU}}{1.7} \times \frac{100}{70}$$

$$\text{Dosage in grams THIAA per hL of beer} = \frac{\text{BU}}{1.7} \times \frac{100}{70} \times \frac{100}{1000}$$

Dosage amount of Tetrahop Gold[®] (9% THIAA) in g/hL:

$$\frac{\text{BU}}{1.7} \times \frac{100}{70} \times \frac{100}{1000} \times \frac{100}{9} \text{ g/hL} = \text{BU} \times 0.93 \text{ g/hL}$$

Dosage amount of Tetrahop Gold[®] (9% THIAA) in mL/hL:

$$\frac{\text{BU}}{1.7} \times \frac{100}{70} \times \frac{100}{1000} \times \frac{100}{9} \times \frac{1}{1.015} \text{ mL/hL} = \frac{\text{BU} \times 0.93 \text{ g/hL}}{1.015 \text{ g/mL}} = \text{BU} \times 0.92 \text{ mL/hL}$$

(e. g. for 5 desired sensory bitterness units $5/1.7 \times 100/70 \times 100/1000 \times 100/9 = 4.7$ g/hL (4.6 mL/hL) of Tetrahop Gold[®] are necessary)

Foam Enhancement:

Calculate required Tetrahop Gold[®] as shown above (for foam and cling enhancement we generally recommend Tetrahop Gold[®] not be added to the final beer at a concentration greater than 5 ppm THIAA). Reduce kettle bittering by an equivalent BU to compensate for the bitterness contribution of Tetrahop Gold[®].

Light Stability:

Tetrahop Gold[®] will only provide protection from light-struck flavour if a complete absence of normal iso- α -acids is achieved, therefore no other sources of non-reduced iso- α -acids should exist in the wort or beer streams. Thus for light-stable beers packaged in clear or green glass bottles, all the hop bitterness must be derived from reduced hop acids such as Tetrahop Gold[®], Redihop[®] or Hexahop[®] products. Iso- α -acids (from equipment or yeast) must not be present in

the beer. If beta extracts are used as kettle additives, ensure that the concentration of α -acids and iso- α -acids are below 0.2%

Packaging:

Normally supplied in high-density polythene containers of 20 kg.

Storage and Best-by Recommendation:

Store Tetrahop Gold[®] in full, closed containers at 15 – 25 °C (59 – 77 °F). Prolonged storage at high temperature will cause deterioration. Tetrahop Gold[®] performs best if used within 24 months from the time of production if stored as recommended.

Safety:

Safety Data Sheet (SDS) is available on our website www.barthhaasgroup.com.

Analytical Methods:

The concentration of tetrahydro-iso- α -acids is measured by UV Spectrophotometry (with modified factors) or by the EBC Method 7.9 (HPLC). Details of recommended methods are available on request.

Technical Support:

We will be pleased to offer help and advice on the use of Tetrahop Gold[®] in brewing.