

TETRA

PRODUCT DATA SHEET

PACKAGED BY

Yakima Chief Hops, 306 Division Street, Yakima, WA 98902 USA, Phone (509) 456-4792, Fax (509) 453-1551

DESCRIPTION

Tetra is a clear, aqueous solution of the potassium salts of hop derived tetrahydroiso-alpha-acids, ranging in color from yellow to amber. Tetra is derived from CO₂ hop extract and is standardized at 9% w/w by HPLC analysis or 10% w/w by Spectrophotometric analysis. Custom blends and formulations may be available upon request.

PACKAGING & STORAGE

Standard packaging is available in 1 kg bottles, 20 kg deltangular tight-head PET containers, and 2 layers of 16 drums per pallet (640 kg). Tetra should be stored at room temperature, preferably between 59°F and 77°F (15°C and 25°C). Under these conditions, Tetra will remain stable in closed container for two (2) years. A deposit may form on prolonged storage at lower temperatures. This deposit re-dissolves on warming up at 77°F (25°C) in a water bath and shaking. Opened containers should be used within 3 months, when store at room temperature.

APPLICATION & USAGE

Tetra can be utilized in the following ways: 1) As 100% of the hop bill or in conjunction with other light stable hop extracts (e.g. Rho, HopAroma products) for the hopping of light stable beers. Tetra is stable to UV light and will not develop sunstruck flavors. 2) As part of your hop formulation to enhance foam stand and cling. Even at relatively low concentrations of 3-5 ppm, foam stand and lacing are significantly enhanced while maintaining the beer's characteristic flavor. Tetra can be considered as a unique brewing ingredient to replace foam additives. 3) As part of your hop formulation to improve long term flavor stability. 4) As part of your hop formulation to differentiate beers. Bitterness intensity is 1.6 times the bitterness per BU when compared to iso-alpha acids. Bitterness profile is sharper and more intense than for iso-alpha acids. This will be perceived at concentrations of 5 ppm and higher, depending on the beer style.

Yakima Chief Hops recommends the direct, undiluted injection of Tetra into the beer stream. If an appropriate pump is not available, Tetra can be diluted with de-ionized water. The dilution factor will be determined according to the available dosing installation. Buffering agents are not required if the solution is dosed within six (6) hours of preparation.

In any case, Tetra should be added to beer after fermentation and primary filtration at a point where there is good mixing and ideally before a final filtration step. A good proportioning over minimum 75% of the filtration time is recommended. Tetra injections should be made with a positive displacement pumping system. CO₂ back pressure should not be used. A 2-3 mm in diameter dip tube positioned in the middle of the beer stream and oriented against it provides excellent dispersion.

USE RATE CALCULATIONS

In optimal dosing conditions the addition of 50 grams of Tetra per 8.5 barrels (10 HL) of finished beer will provide 5 bitter units. To calculate grams per hectoliter based on 70% utilization and 1.6 times the bitterness of iso-alpha acid use: **kg product = (IBU / 1.6) / 70 x hl / 9**

Where: IBU = international bitterness unit desired, hl = is hector liters of finished beer (1 barrel = 1.173 hectoliters). Use rates may vary depending on the point of addition (location & design) and the hopping level.

YIELD & CHARACTERISTICS

Yield can be dramatically affected by the presence of the following: Adsorbent factors such as yeast, kieselguhr, silica gel, PVPP and pH reduction such as CO₂, sugar, syrups.

Flavor of a solution in de-ionized water containing 5ppm of tetrahydroiso-alpha-acids: A fine bitterness with no other detectable flavors

Aroma of a solution in de-ionized water containing 5ppm of tetrahydroiso-alpha-acids: None Detectable

Gushing potential in beer: No increased potential at dosages up to 5ppm of THIAA



YAKIMA CHIEF HOPS®



TETRA SPECIFICATION SHEET

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HOP ACIDS ASSAY	METHOD	TYPICAL ANALYSIS
Tetrahydroiso-alpha-acids (THIAA)	HPLC by EBC 7.9 (Tetra Std.) / Uv Spectro.	9.0% +/- 0.3% (w/w) / 10% +/- 0.3% (w/w)
Iso-alpha-acids (IAA)	EBC 7.9 (Iso Std.)	< 0.1% (w/w)

	METHOD	TYPICAL ANALYSIS
Area Purity	THIAA Peak Area as % of Total Area HPLC by EBC 7.9 (Tetra Std.)	> 90%
pH		> 8.5
Haze Of 1.0% Solution	Haze Units, EBC 9.16	< 0.5
Specific Gravity		1.02 +/- 0.01
Lead		< 1.0 ppm
Arsenic		< 0.5 ppm
Cadmium		< 0.03 ppm
Total Heavy Metals (as Pb eq.)		< 10 ppm

* NOTE: Concentration dependent upon variety of hops and crop year



TETRA

SAFETY DATA SHEET

1. PRODUCT IDENTIFICATION

1.1 Product Name	Tetra (Tetra 10%, Aqueous Tetra, Potassium Salts of tetrahydroiso-alpha-acids) Made from CO2 Hop Extract
1.2 Supplier	Yakima Chief Hops, Inc. 306 Division St. Yakima, WA 98902 (USA) Phone: 1.509.453.4792 Email: Quality@Yakimachief.com Website: Yakimachief.com
1.3 Recommended Use	Ingredient used in brewing beer.
1.4 Restrictions on Use	None

2. HAZARD IDENTIFICATION

2.1 Hazard Classification	Not Applicable Product is natural.
2.2 Label Elements	Not Applicable
2.3 Other Hazards	Prolonged skin contact could cause dermatitis in some individuals.

3. COMPOSITION, INGREDIENT INFORMATION

3.1 Composition	An aqueous solution the potassium salts of the tetrahydroiso-alpha-acids produced by isomerizing and hydrogenating the alpha-acids from CO2 hop extract.
3.2 Hazard Components	Not Applicable Product is natural.

4. FIRST AID MEASURES

4.1 Oral Ingestion	Not Applicable
4.2 Eye Contact	Wash with copious amounts of water. Seek medical attention if irritation persists.
4.3 Skin Contact	Wash with warm, soapy water. Seek medical attention if irritation persists. Launder contaminated clothing before reuse.
4.4 Inhalation	Remove affected person to fresh air. Administer oxygen if necessary.
4.5 Symptoms	None Known

5. FIRE FIGHTING MEASURES

5.1 Extinguishing Media	Dry Powder, Foam, Water, CO2
5.2 Hazards from Fire	None Known

6. ACCIDENTAL RELEASE MEASURES

6.1 Procedure	Scoop/shovel spilled material into recovery container. Flush area with hot soapy water to remove final traces.
6.2 Protective Equipment	Use adequate ventilation or a respirator if in a confined area. Use rubber gloves. Wear Safety Glasses.

7. HANDLING AND STORAGE

7.1 Handling Equipment	Closed Container of Food Grade Quality Stainless Steel, Lacquered Steel or PET
7.2 Precautions	Avoid prolonged skin contact. Use personal protective equipment (Section 8)
7.3 Storage Conditions	Store in unopened container at 59°F to 77°F (15°C to 25°C)

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

8.1 Permissible Exposure Limits (PELs)	Not Applicable
8.2 Threshold Limit Values (TLVs)	Not Applicable
8.3 Engineering Controls	Provide adequate ventilation
8.4 Personal Protective Equipment (PPE)	Skin Protection: wear rubber gloves if prolonged exposure Eye Protection: wear safety glasses

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Appearance & Odor	Amber brown resin w/ slight resinous odor.
9.2 Odor	Slight resinous odor.
9.3 Odor Threshold	No data available
9.4 pH	8.5 - 11
9.5 Freezing Point	< 0°C
9.6 Boiling Point	> 100°C
9.7 Flash Point	Not applicable
9.8 Evaporation Rate	< 1
9.9 Flammability	No data available
9.10 Upper/Lower Flammability	No data available
9.11 Vapor Pressure	No data available
9.12 Vapor Density	No data available
9.13 Density	1.02 +/-0.01
9.14 Solubility in Water	Complete at pH 10
9.15 Partition coefficient	No data available
9.16 Auto-ignition Temperature	No data available
9.17 Decomposition Temperature	No data available
9.18 Viscosity	No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity	Product is sensitive to oxidation in open containers, and/or under excessive temperatures
10.2 Stability	Product is stable under appropriate storage conditions, in closed containers and/or under inert atmosphere. (Section 7.3)
10.3 Possibility of Hazardous Reactions	None known
10.4 Conditions to Avoid	See Section 7.3
10.5 Incompatible Materials	None Known
10.6 Hazardous Decomposition Products	None Known

11. TOXICOLOGICAL INFORMATION

11.1 Acute Toxicity	None Known. Product is "Generally Recognized As Safe" (GRAS 21 CFR 182.20)
11.2 Routes of Exposure	Inhalation: No data available Ingestion: No data available Skin contact: No data available Eye contact: No data available
11.3 National Toxicology Program	Not listed on Report of Carcinogens

12. ECOLOGICAL INFORMATION

12.1 Toxicity	No data available
12.2 Potential for Persistence and Degradation	No data available. Product is all natural and biodegradable.
12.3 Bioaccumulation	No data available. Product is all natural.
12.4 Mobility in Soil	No data available
12.5 Other effects	No data available

13. DISPOSAL CONSIDERATIONS

13.1 Product Disposal	According to regulations in force.
13.2 Packaging Disposal	According to regulations in force; for paper/cardboard, steel and PET.

14. TRANSPORTATION INFORMATION

14.1 UN Number	Non-hazardous product
14.2 Shipping Name	Tetra
14.3 Hazard Class	Non-hazardous product
14.4 Packing Group	Non-hazardous product
14.5 Environmental Hazards	Non-hazardous product
14.6 Other	Product is not classified as ADR and should not be transported along with ADR classified Cargo. Product should be stored away from engines or any heat source during transportation.

15. REGULATORY INFORMATION

15.1 Regulations	Food Safe Heavy Metals, Pesticides/Herbicides/Fungicides, Nitrates, Radioactivity: Below tolerance levels. Allergenic-Free Non GMO Traceable
15.2 REACH	Not Applicable (No EINECS Ref.)

16. OTHER INFORMATION

16.1 Issue Date	2015-05May-26
16.2 Revision Date	2018-08Aug-20
16.3 Other	