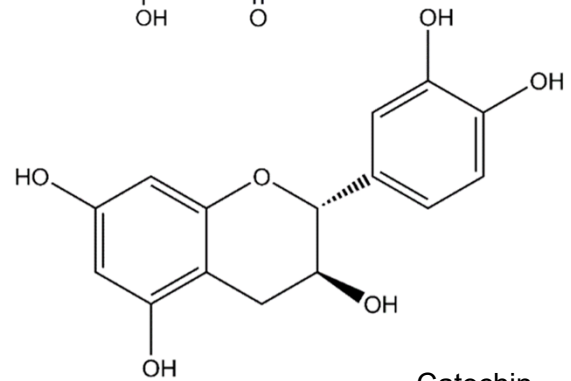
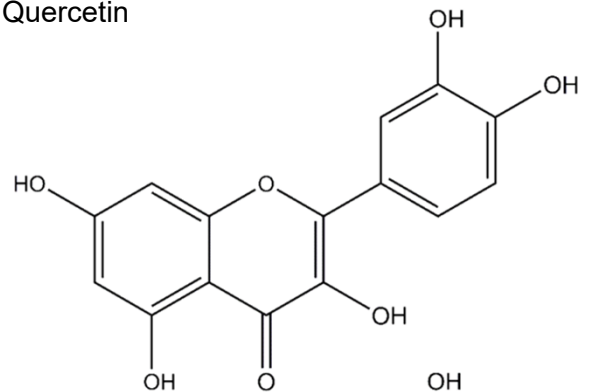


## Polyphenol Aroma Pellets

### ❖ Overview

- **Polyphenol Aroma Pellets** are a hop product made from leaf hops, added to the wort kettle during the boiling process. They are rich in a range of hop polyphenols.
- **Polyphenol Aroma Pellets** can be added to provide additional polyphenols in situations where high levels of pure starch or sugar adjuncts are used. The addition of polyphenols helps to ensure that sufficient protein coagulation and precipitation occurs during the brewing process.
- **Polyphenol Aroma Pellets** provide some hop aroma and minimal amounts of bitterness.

Quercetin



Catechin

### ❖ Specifications

- Description: de-bittered hop powder (from production of type 45 pellets) compressed into cylindrical pellets
- Consistency\*: solid, which normally breaks up into a powder
- Color\*: pale yellow-green
- Alpha acids\*: < 1.5 %
- Polyphenols\*: > 4.0 %
- Hop oil\*: < 0.1 %
- Moisture content: < 11.0 %

\*dependent on variety

## ❖ Properties

### • Appearance

**Polyphenol Aroma Pellets** are pale yellow-green pellets, approximately 8 mm x 10 – 25 mm in size (diameter x length).

### • Utilization

Actual utilization will vary from brewery to brewery due to differences in equipment and process conditions.

### • Flavor

**Polyphenol Aroma Pellets** produce a minimal bitter flavor. The hard resins and polyphenols in the pellets have been shown to contribute to improved mouthfeel and overall beer flavor. Moreover, key flavor compounds (e.g. linalool) can impart a pleasant hoppy character to beer.

### • Quality

All Hopsteiner® products are processed in facilities which fulfill internationally recognized quality standards.

## ❖ Packaging

**Polyphenol Aroma Pellets** are packaged in metallized five-layer foil bags which are then packed in boxes. These are available as 'soft' packs flushed with inert gas (N<sub>2</sub> and/or CO<sub>2</sub>) at atmospheric pressure. The typical pack size is 150 kg (330 lb). Other sizes are available on request.

## ❖ Product Use

**Polyphenol Aroma Pellets** are used to supplement the polyphenols derived from malt and hops to ensure sufficient precipitation of proteins, thereby improving the colloidal stability of the finished beer.

### • Dosage

The quantity of **Polyphenol Aroma Pellets** to be added depends on the application and will vary according to the raw materials and other hop products used in the brewing process. They can be added at any time during the boil.

To establish what impact they will have on beer flavor, brewing trials are recommended as the quality and quantity of the compounds imparting the bitterness, aroma and flavor will vary among varieties.

### • Application

**Polyphenol Aroma Pellets** can be manually weighed out and added directly to the wort. Alternatively, owing to their free-flowing nature, additions of **Polyphenol Aroma Pellets** can be automated.

### • Storage

**Polyphenol Aroma Pellets** should be stored at low temperatures (< 5 °C or < 41 °F). Pellets in opened foil packs should be used quickly to avoid deterioration.

### • Best Before Date

**Polyphenol Aroma Pellets** are stable for five years from the date they were produced / packaged if stored under the recommended conditions.

### • Safety

There are no known, serious health hazards associated with normal use. When handling this product, it is advisable to wear a dust mask. Hop pellets are combustible.

For full safety information, please refer to the relevant Hopsteiner® safety data sheet.

## ❖ Analytical Methods

### • Concentration of Polyphenols

Hop-derived polyphenols can be measured using the following methods:

- Analytica-EBC 7.14
- low molecular weight polyphenols by HPLC using the relevant pure substances as external calibration standards

### • Concentration of Bitter Substances

Alpha and beta acids can be measured using the following methods:

- HPLC according to Analytica-EBC 7.7 or ASBC Hops-14 with the current ICE standard
- spectrophotometric method according to ASBC Hops-6A

The lead conductance value can be measured using the following methods:

- Analytica-EBC 7.4 or 7.5
- ASBC Hops-6B

### • Concentration of Hop Oils

Due to the low amount of hop oil present in **Polyphenol Aroma Pellets**, the concentration cannot be measured using any of the methods currently available.

## ❖ Technical Support

We are pleased to offer assistance and advice on the full range of Hopsteiner® products:

- copies of all relevant analytical procedures
- Safety Data Sheets (SDS)
- assistance with pilot or full-scale brewing trials
- special analytical services

Disclaimer: The information provided in this document is believed to be correct and valid. However, Hopsteiner® does not guarantee that the information provided here is complete or accurate and thus assumes no liability for any consequences resulting from its application.