

## Brewing with Terpenes

v.1.2

So, you want to brew terpene infused beer? Cool. We can help you succeed!

To begin with, you need to define your goals. For example, do you want increased hop aroma and flavor, a dank-resinous aroma, or something else, like a piney, citrusy, or fruity aroma or flavor? Then, you need to choose terpene isolates and/or blends that meet your goals according to their aromas and flavors. To achieve specific goals, you can use more than one type of terpene isolate or blend per batch. Terpene products do not increase bitters (alpha acids).

Testing is required to optimize the quantity of terpenes to achieve a desired result. Utilizing a sensory panel is recommended to dial in use rates. Suggested use rates are 0.01% to 0.02% (w/v) of terpenes to beer. So, for a barrel that's 11.75 to 22.35 grams of terpenes. You can increase the quantity of terpenes until you are happy with the result. However, higher use rates may result in a cloudy suspension - as will use opaque terpene product(s).

We recommend adding terpene product(s) after the cold-side trüb dump, before carbonating the beer in a bright beer tank or unitank. If you use a bright beer tank, adding the terpenes as the beer is filling the bright beer tank is recommended. Injecting a few bursts of CO<sub>2</sub> after adding the terpenes will help mix them into the beer.

Terpene products that are insoluble or practically insoluble should be dissolved into a solvent like 190 proof EverClear or food grade 95% ethanol. Recommended terpene to solvent ratio is 1:5 to 1:9 (w/w). So, using 0.01% terpenes per barrel with a 1:9 terpene to solvent ratio translates into 105.61 grams of solvent per barrel.

Inclusion of terpenes and solvent into production batches requires TTB formula review. All of our products are free of THC and CBD, and were not extracted from *Cannabis sativa* L. We are currently in the process of creating TTB FID documentation.

Brewers who wish to avoid solvents may add terpenes directly to the bitter wort before pitching yeast. However, through oxidation and biotransformation, yeast may convert <sup>[1,2]</sup> some of the terpenes into unwanted terpenes and substances. Additionally, the vigorous activity of the yeast may blow out some of the terpenes from the wort.

Below are some of the most common individual terpenes found in hop and cannabis:

- Myrcene (herbal, terpenic-resinous-dank, spicy aroma characteristics)
- beta-Caryophyllene (spicy, clove, woody aroma characteristics)
- Limonene (citrus, fruity aroma characteristics)
- Humulene (woody, earthy, spicy aroma characteristics)
- alpha-Pinene (pine, terpenic-resinous-dank, woody aroma characteristics)

Below are the terpenes comprising lower percentages of individual terpenes from hops and cannabis:

- Linalool (floral, citrus, sweet aroma characteristics)
- Geraniol (rose, floral aroma characteristics)
- alpha-terpineol (terpenic-resinous, pine, lilac, floral aroma characteristics)

**Happy brewing!**

[1] Biotransformation of hop aroma terpenoids by ale and lager yeasts; *FEMS Yeast Research*, 2003, 3(1):53-62

[2] Biotransformation of hop-derived monoterpene alcohols by lager yeast and their contribution to the flavor of hopped beer; *Journal of Agricultural and Food Chemistry*, 2010, 58(8):5050-5058