

Differences between Total Resin Extract (Ethanol-Extract) and CO₂-Extract – Page 1

	Total Resin Extract (TRE)	CO ₂ -Extract
Production		
Extraction process	Continuous process	Batch process
Solvent	Fermentation alcohol	Carbon dioxide (supercritical)
Starting material	Leaf hops	Hop pellets
Production temperature	55-60 °C, shortly 78 °C during evaporation of ethanol	< 60 °C
Pressure of extraction	Atmospheric pressure	Up to 300 bar in case of supercritical extracts
Duration of extraction	70-80 minutes	5-6 hours
Composition		
Bittering compounds	TRE contains all bittering compounds of leaf hops (alpha acids, beta acids, non-specific soft and hard resins) in a variety specific composition.	By using carbon dioxide, alpha and beta acids are extracted primarily (selective extraction). Compared to leaf hops, the spectrum of bittering compounds differs slightly.
s-Fraction „non-specific bittering compounds in hops“	Contained in TRE. These bittering compounds contribute to the intensity of the beer bitterness.	Barely present in CO ₂ -Extract
Xanthohumol	Contained in TRE	Not contained in CO ₂ -Extract
Hop oils	Compared to leaf hops, approx. 40 % of myrcene is reduced. Other hop oil components are almost completely present.	Certain reduction of myrcene due to previous pellet production process. Other hop oil components are almost completely present.
Purity		
Plant protection (Active compounds)	Partly reduced (polarity dependent)	Partly reduced (polarity dependent)
Nitrates	Reduction of almost 100 % in case of pure resin extract. If tannin extract is used for the standardisation, there's less reduction of nitrates.	100 % elimination in case of pure resin extracts. If tannin extract is used for standardisation, there's less reduction of nitrates
Heavy metals	Reduction > 90 %	Reduction > 95 %
Profitability		
Utilization and isomerisation of alpha acids during wort boiling	Good isomerisation due to excellent solubility of the extract.	Same or slightly slower isomerisation depending on type of brew house.
Production costs	Continuous production process results in high capacity and very efficient production.	No continuous production process. Slightly higher production costs due to pelletization of hops prior to extraction.



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	Total Resin Extract (TRE)	CO ₂ -Extract
Usage in the brewhouse		
Dosage	<p>Typically dosed according to CBV (= conductometric bitter value).</p> <p>CBV in TRE corresponds to CV (conductometric value) in leaf hops and hop pellets. As CBV and CV analyse not only alpha acids, but also other bittering compounds, they correlate better than the specific HPLC method with the resulting bitter units in beer.</p> <p>If heating chambers for automatic dosing systems are used, the extract should be consumed within one week.</p>	<p>Typically dosed according to HPLC.</p> <p>The HPLC method specifically analyses the alpha acids, but none of the „non-specific bittering compounds“.</p> <p>As CO₂-Extract does not contain these components, HPLC and conductometric analyses show almost identical results. Therefore it does not matter whether dosing is based on HPLC or CV.</p> <p>If heating chambers for automatic dosing systems are used, the extract should be consumed within two weeks.</p>
Storage stability		
Best before date	If stored below 10 °C excellent stability for at least 8 years.	If stored below 10 °C excellent stability for at least 8 years.