

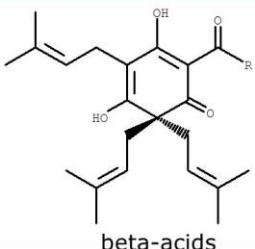
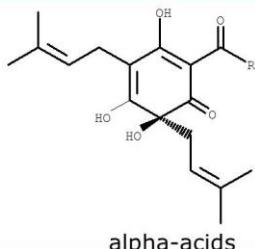
The ingredients of hops

water
sugars
amino acids
salts



chlorophyll
cellulose
proteins
pectins

bitter substances



	alpha-acids	beta-acids
R=CH ₂ CH(CH ₃) ₂	n-humulone	n-lupulone
R= CH(CH ₃) ₂	cohumulone	colupulone
R= CH(CH ₃)CH ₂ CH ₃	adhumulone	adlupulone
R= CH ₂ CH ₂ CH(CH ₃) ₂	prähumulone	prälupulone
R= CH ₂ CH ₃	posthumulone	postlupulone

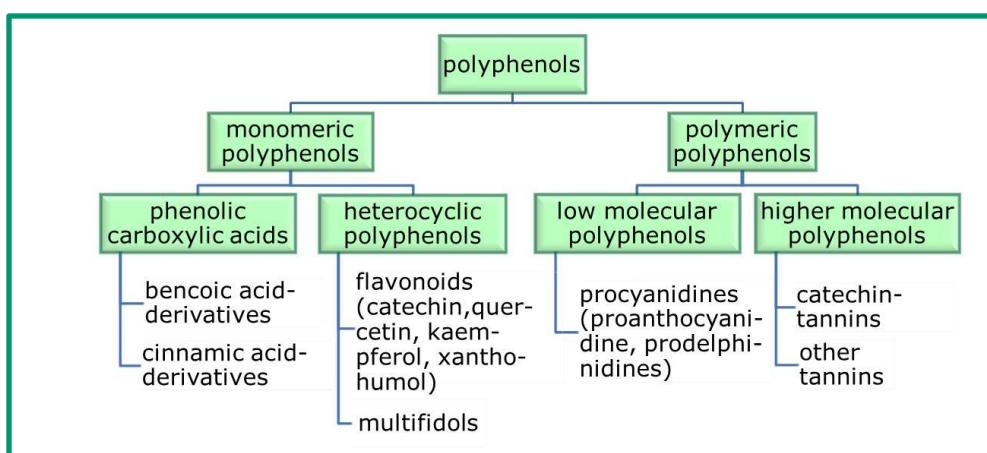
essential oils

hydrocarbons	oxygen-containing compounds	sulfur-containing compounds
monoterpenes α -pinene, β -pinene, myrcene	hemiterpene alcohols 2-Methyl-3-but-en-2-ol	sulfides dimethyl sulfide, dimethyl disulfide, dimethyl trisulfide
sesquiterpenes β -caryophyllene, α -humulene, β -farnesene	monoterpene alcohols linalool, β -terpineol, geraniol	thioester S-methyl-thiohexanoate
other aliphatic hydrocarbons pentadecane	sesquiterpene alcohols humulenol, farnesol	thiole and other sulfur-containing compounds 4-methyl-4-mercaptop-2-pentanone (4MMP)
	other oxygen-containing compounds aldehydes, ketones, ester, epoxides	

- conductometric titration titration (EBC 7.4, 7.5)
- HPLC (EBC 7.7)
- NIR-spectroscopy

- steam distillation,
- gaschromatography-mass spectrometry, (300-400 single compounds)

polyphenols



- spectral photometry (total polyphenols, flavonoids)
- HPLC (single compounds)