

Lúpulo y Lupuladas (clase 1)



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El Lúpulo

WHAT ARE HOPS?

- Perennial bining plant that dies in the winter and grows back year after year in the spring.
- Only female plants produce hop cones.
- Hops grow “bines” on wires connected to a trellis system.
- Harvested hop cones can be turned into hop pellets or have their alpha acids extracted into a hop liquid extract.



LUPULIN GLAND

Hops contain soft and hard resins. The soft resins in the lupulin gland contain the hop's alpha and beta acids and essential oils.

ALPHA ACIDS

Chemicals that make hops anti-microbial

Add bitterness to beer when boiled

BETA ACIDS

Provide bitterness as they oxidize

ESSENTIAL OILS

Principle aroma elements of hops

Provide aromas and flavors:

CITRUS	WOODY
PINE	FLORAL
CHEESY	SPICY

POLYPHENOLS

Contribute to both beer stability and haze

Anatomía del Lúpulo

HOP ANATOMY

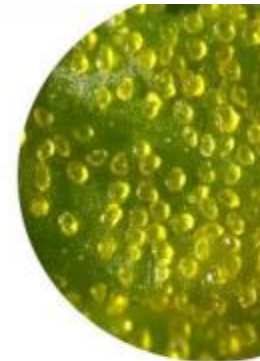


Lupulin

Leaf/Bract

Alpha Acids 2-20%
Beta Acids 2-20%
Hop Oils 0.5-4%
Lipids 1-5%

Polyphenols
& Tannins 3-6%
Terpene-Glycosides
Cellulose 40-50%
Proteins 15%
Water 8-11%



Variedades

Domestic	Alpha Acids*	Cohumulone*	Total Oil* (mL/100 g)	Oil : Alpha Ratio **	Aroma Notes
CHINOOK (NZ)	12.2%	31.5%	0.9	7.4	Pine, herbal, subtle grapefruit
DR RUDI	11.0%	33.0%	1.3	11.8	Citrus, pine, lemongrass
FUGGLE (NZ)	6.1%	28.5%	0.9	14.8	Mild fruit, herbal, woody, grassy
GOLDING (NZ)	4.1%	22.5%	0.3	7.3	Sweet citrus fruits, floral nectar
GREEN BULLET	12.5%	38.5%	1.1	8.8	Floral, spicy, fruity, pine
KOHATU	6.5%	21.0%	1.0	15.4	Intense floral, grapefruit, pine, tropical fruit. Pineapple.
LIBERTY (NZ)	5.9%	27.0%	0.7	11.9	Slightly spicy, resiny
MOUTERE	18.5%	26.0%	1.7	9.2	Citrus, fruit, pine, spice.
MOTUEKA	7.0%	29.0%	0.8	11.4	Lemon/lime, tropical fruit, spice. "Mojito".
NELSON SAUVIN	12.5%	24.0%	1.1	8.8	White wine, grapefruit, tangy berries
PACIFIC GEM	14.0%	37.0%	1.2	8.6	Strawberry, blackberry. Tangy citrus, melon, tangerine.
PACIFIC JADE	13.0%	24.0%	1.4	10.8	Fresh citrus, crushed black pepper
PACIFICA	5.5%	25.0%	1.0	18.2	Orange marmalade, citrus, floral
RAKAU	10.5%	24.0%	2.2	21.0	Fresh stonefruit, grassy, spicy, citrus
RIWAKA	5.5%	32.0%	1.5	27.3	Strong grapefruit, citrus
SOUTHERN CROSS	12.5%	26.5%	1.2	9.6	Lemon peel, lime, pine needles.
STICKLEBRACK	12.3%	38.0%	0.8	6.5	Citrus, pine
STYR. GOLDING (NZ)	5.6%	27.5%	0.6	10.7	Mild, spicy
TAIHEKE	7.0%	37.0%	1.1	15.7	Grapefruit, lime, tropical fruit
WAI-ITI	3.0%	23.0%	1.6	53.3	Citrus, stonefruit, spice
WAIMEA	17.5%	23.0%	2.1	12.0	Pine needles, citrus fruit, grapefruit, tangerine
WAKATU	7.5%	29.0%	1.0	13.3	Floral, fresh citrus akin to freshly zested lime peel
WILLAMETTE (NZ)	6.8%	32.5%	1.5	22.1	Spicy, floral, herbal, earthy
WYE CHALLENGER (NZ)	8.9%	22.5%	0.6	6.7	Floral, spice, some citrus

Variedades

Imported - USA	Alpha Acids*	Cohumulone*	Total Oil* (mL/100 g)	Oil : Alpha Ratio **	Aroma Notes
Amarillo	9.0%	22.0%	1.65	18.3	Grapefruit, orange, lemon, melon, floral, apricot, peach
Cascade (US)	7.3%	32.5%	1.65	22.6	Floral, citrus, grapefruit
Centennial	9.5%	25.0%	2	21.1	Lemon, floral
Centennial "Type"	9.0%	33.0%	1.8	20.0	Lemon, floral
Chinook (US)	13.3%	29.0%	1.75	13.2	Pine, spice, some grapefruit
Citra	13.0%	22.0%	2.25	17.3	Grapefruit, melon, lime, gooseberry, passionfruit, lychee, mango
Columbus	16.0%	29.0%	3.5	21.9	Black pepper, liquorice, curry, earthy, resinous, herbal, subtle citrus
Crystal	4.5%	24.5%	1.55	34.4	Floral, spicy, woody
Ekuanot	14.3%	33.5%	3.25	22.7	Melon, berry, orange peel, lemon, lime, papaya, pine, apple, floral, green peppers
Horizon	10.4%	17.5%	1	9.6	Floral bouquet, spicy, some citrus
Liberty (US)	4.8%	23.0%	1.4	29.2	Floral bouquet, spice
Mosaic	12.3%	23.0%	1.9	15.4	Blueberry, tangerine, papaya, rose, blossoms, grass, bubble gum, mango, stonefruit, melon
Newport	11.3%	37.0%	2.05	18.1	Earthy, citrus, wine, balsamic
Nugget	14.8%	24.0%	2	13.5	Herbal, spice, some pear, some peach
Perle	7.5%	29.5%	1.4	18.7	Floral, spice, mint
Santiam	7.3%	23.0%	1.6	21.9	Herbal, floral, black pepper, spice
Simcoe	13.3%	19.0%	2	15.0	Passionfruit, pine, sweet berries, citrus, earthy, perfume
Summit	16.0%	30.5%	2.25	14.1	Pepper, incense, anise, orange, tangerine, pink grapefruit
Tahoma	6.8%	16.0%	1.75	25.7	Lemon, grapefruit, cedar, pine, floral, pepper, some melon
Warrior	16.8%	26.5%	1.75	10.4	Lemon, pine
Willamette (US)	5.5%	30.0%	1.1	20.0	Floral, herbal, incense, earthy, elderberry
Yakima Gold	9.7%	22.0%	2.1	21.6	Grapefruit, lemon zest
Zythos	11.3%	29.5%	0.95	8.4	Tangerine, grapefruit, lemon, pineapple, floral, some pine

Variedades

Imported - Europe	Alpha Acids*	Cohumulone*	Total Oil* (mL/100 g)	Oil : Alpha Ratio **	Aroma Notes
Saaz (Czech)	3.5%	24.5%	0.6	17.1	Earthy, herbal, floral
Hallertau Hersbrucker (DE)	3.5%	22.0%	0.9	25.7	Floral, spice, fruit
Hallertau Tradition (DE)	5.8%	26.0%	1.4	24.1	Earthy, grassy, nectarous fruits
Herkules (DE)	14.5%	35.0%	2.0	13.8	Spice, pine, pepper, slight citrus and melon fruit
Huell Melon (DE)	7.2%	27.5%	0.8	11.1	Melon, strawberry
Magnum (DE)	13.5%	25.0%	2.1	15.6	Apple, pepper
Mandarina Bavaria (DE)	8.5%	33.0%	2.2	25.9	Satsuma mandarin, tangerine, orange
Northern Brewer (DE)	8.0%	29.5%	1.3	16.3	Mint, pine, grass
Saphir (DE)	3.0%	14.5%	1.1	36.7	"Sweet citrus bouquet", tangerine, fruit, floral, spice
Spalt Select (DE)	4.5%	24.0%	0.9	18.9	Noble, spice
Tettnang (DE)	4.5%	25.5%	0.7	15.6	Spice, herbal, pepper, black tea
Sybilla (PL)	7.0%	28.5%	1.9	26.4	Lemon, pine, floral
Triskel (FR)	8.5%	21.5%	1.8	20.6	Floral, herbal, spice, some citrus
Junga (PL)	11.5%	31.5%	2.3	20.0	Blackcurrant, grapefruit, spice
Lubelski (PL)	4.0%	26.5%	0.9	21.3	Magnolia, lavender, floral
Marynka (PL)	8.5%	29.5%	2.0	23.5	Floral, earthy
Dana (SI)	13.5%	29.5%	3.2	23.3	Floral, lemon, pine
Styrian Golding (SI)	4.4%	27.5%	0.8	17.0	Earthy, some white pepper

Variedades

Imported - UK	Alpha Acids*	Cohumulone*	Total Oil* (mL/100 g)	Oil : Alpha Ratio **	Aroma Notes
Boadicea	8.5%	26.0%	1.7	20.0	Floral, orchard blossom, grass, subtle spice
Bramling Cross	6.0%	34.0%	0.9	14.2	Blackberry, currant, plum, loganberry, lemon, spice
Challenger	7.5%	22.5%	1.4	18.0	Spice, cedar, green tea, sweet floral, some citrus
East Kent Golding	5.5%	30.0%	0.6	10.9	Floral, spice, lavender, thyme, honey, earthy, lemon, orange, grapefruit
Endeavour	9.3%	33.0%	1.4	15.1	Blackcurrant, loganberry, grapefruit, lime, spice
Epic	4.0%	31.5%	0.6	15.0	Grass, lemon, spice
First Gold	7.5%	33.0%	1.1	14.7	Tangerine, orange marmalade, apricot, geranium, magnolia, mint
Fuggle (UK)	4.3%	27.5%	1.1	24.4	Floral, mint, earthy, grass, spice
Golding (UK)	5.0%	25.5%	0.9	17.0	Floral, zesty lemon, orange, grapefruit
Minstrel	6.0%	24.0%	0.6	10.0	Spice, berries, orange, herbal
Phoenix	10.0%	28.5%	1.9	18.5	Spice, floral, chocolate
Pilgrim	11.0%	37.0%	1.8	16.4	Spice, herbal, earthy, cedar, honey, lemon, grapefruit, pear, berry
Pilot	9.8%	32.5%	1.1	11.2	Lemon, marmalade, spice
Progress	6.8%	27.5%	0.7	9.6	Earthy, spice, juniper, mint, grass, honey, blackcurrant
Sovereign	5.5%	28.0%	0.8	14.5	Intense fruit, floral, earthy, herbal, pine
Target	11.0%	37.5%	1.3	11.8	Sage, spice, pepper, herbal, floral, earthy, marmalade
Whitbread Golding	6.6%	37.5%	1.0	15.2	Earthy, botanical, floral, sweet fruit

HOP VARIETIES

and their characters



BASED ON JOHN PALMER'S HOP WHEEL • REDESIGNED AND UPDATED BY TIM KREITZ

F - Also Floral | **U** - Also Fruity | **C** - Also Citrusy | **H** - Also Herbal
R - Also Grassy/Earthy | **V** - Also Evergreen | **S** - Also Spicy

Hoy vamos a hablar de «aroma»

- **La química del aroma es mucho más compleja que la del amargor**
- **La cromatografía gaseosa (1950) permitió descubrir los cientos de componentes del lúpulo que impactan en aroma**
- **No existe una simple fórmula que correlacione la composición en aceites y el flavor desarrollado**
- **El aroma a «lúpulo», hoppy aroma es una combinación sinérgica**

Ocurres cosas tan complejas como esto:

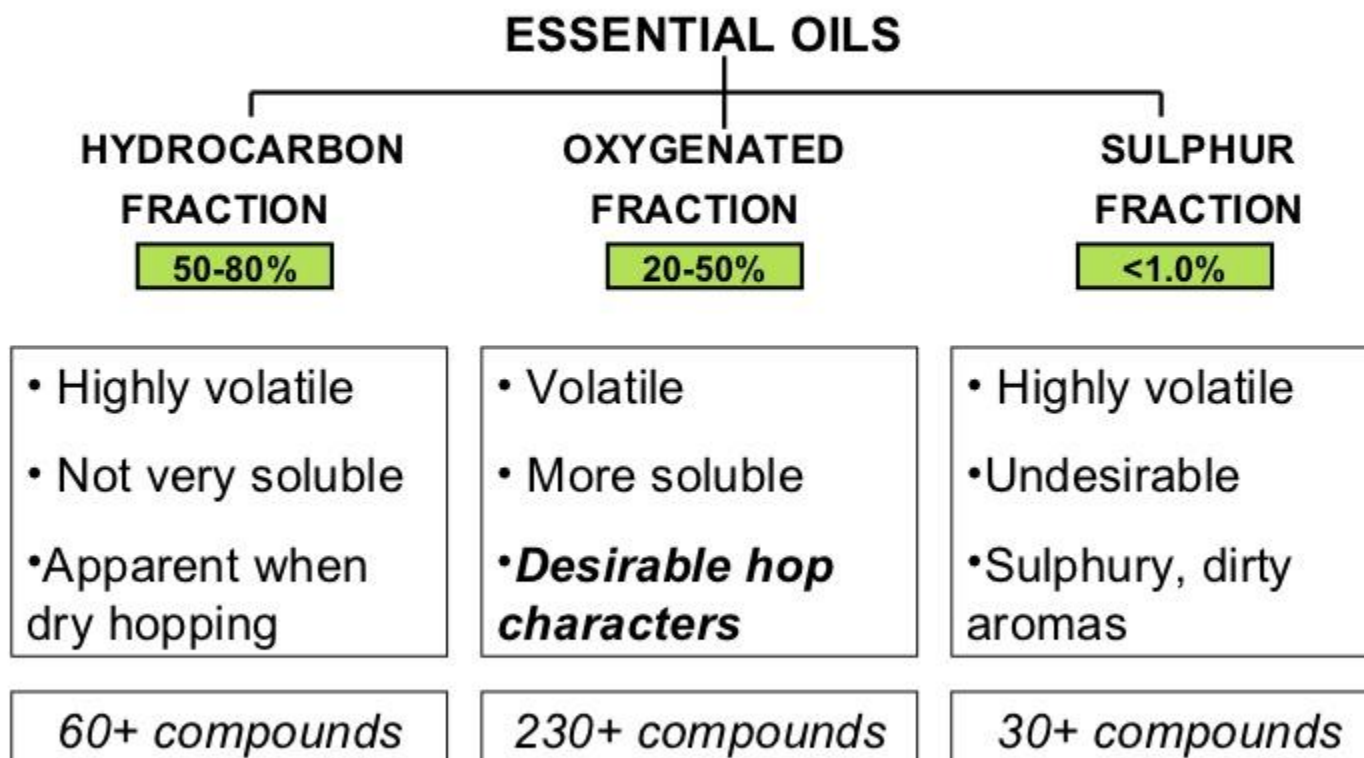
Un estudio alemán reportó que una mezcla de cariofileno y nerol (2 componentes del aceite de los lúpulos) tendría un umbral de flavor de unos 170 ppb.

Comparado con los umbrales individuales de 210 y 1200 ppb respectivamente. Lo mismo ocurre con otras combinaciones.

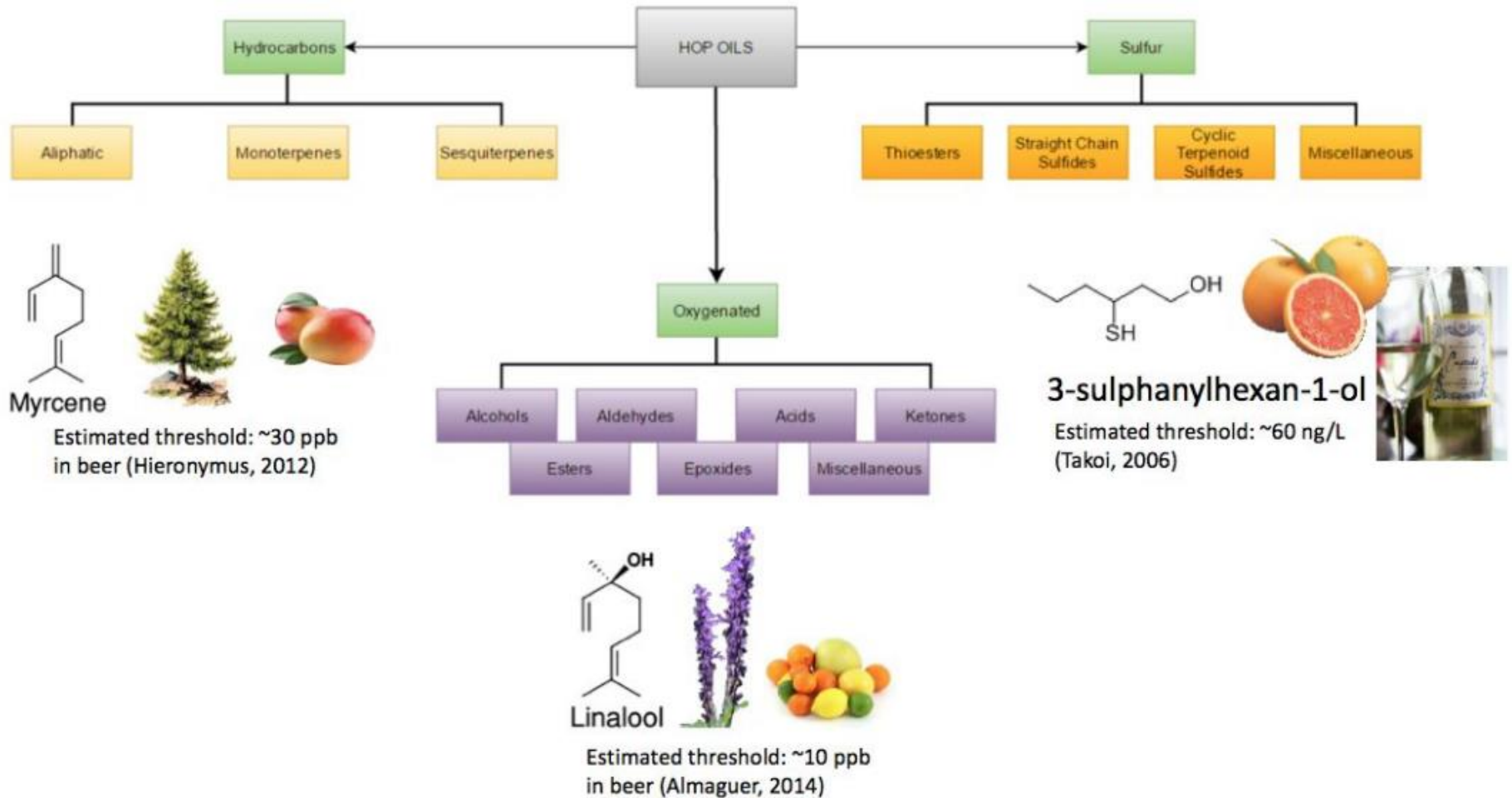
Los porcentajes de cada componente en las mezclas también cambian los umbrales de percepción

Aceites

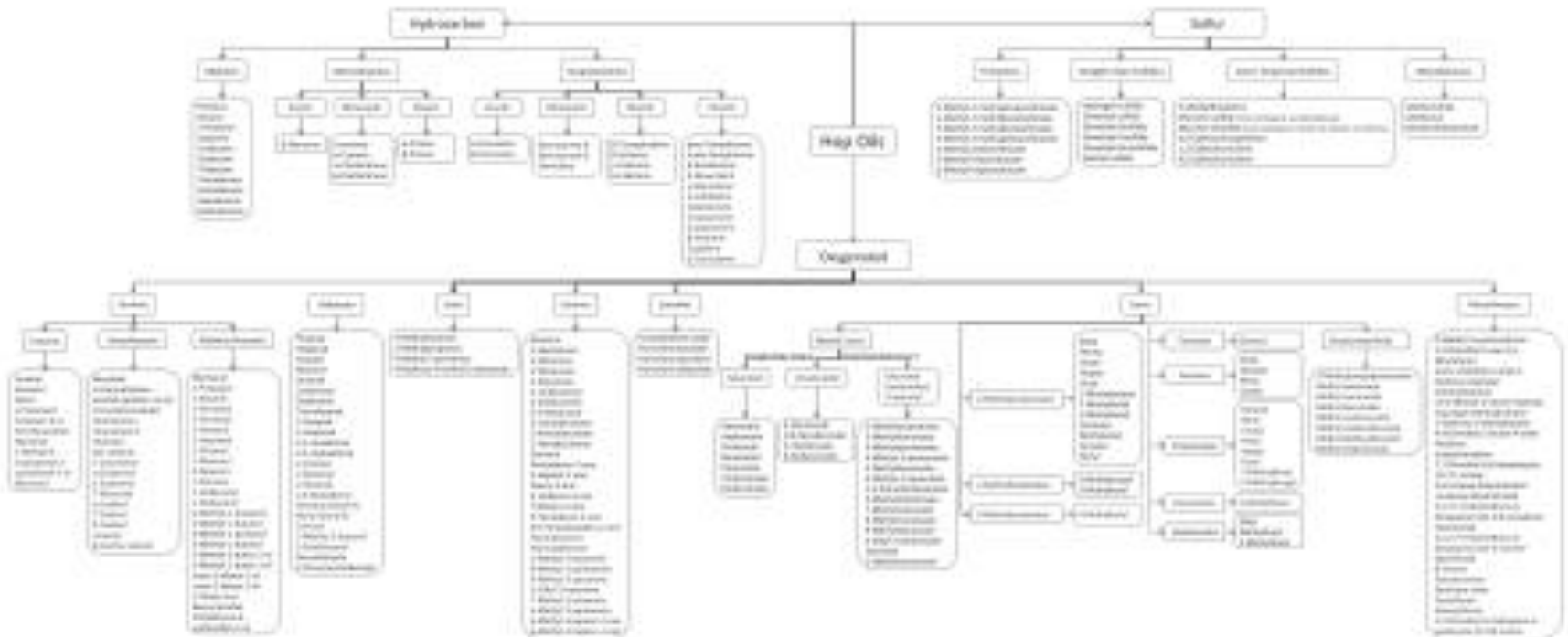
Principal Constituents of *Hop Oils*



Aceites

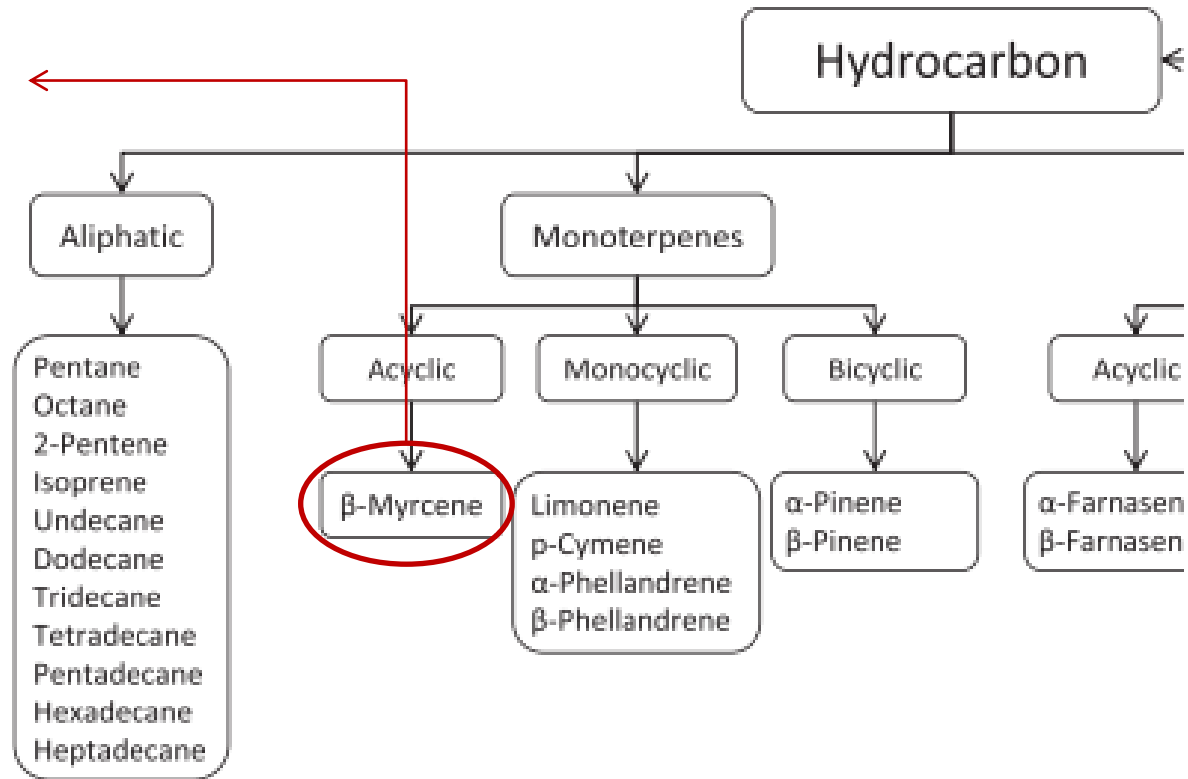


Aceites



Aceites

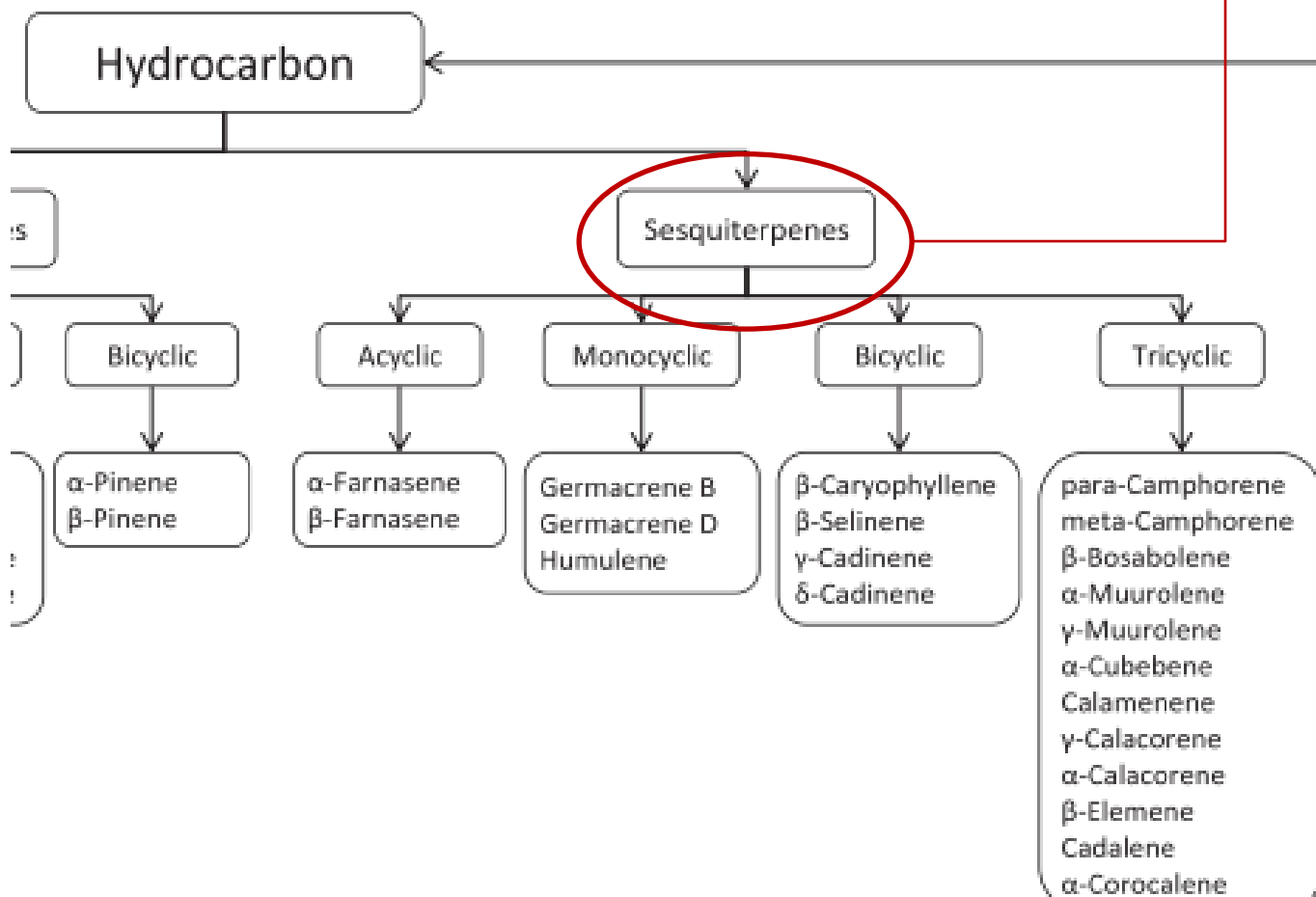
Aroma a
lúpulo fresco



Hidrocarbonados: fracción muy volátil y muy poco soluble. Se oxidan y polimerizan fácilmente.

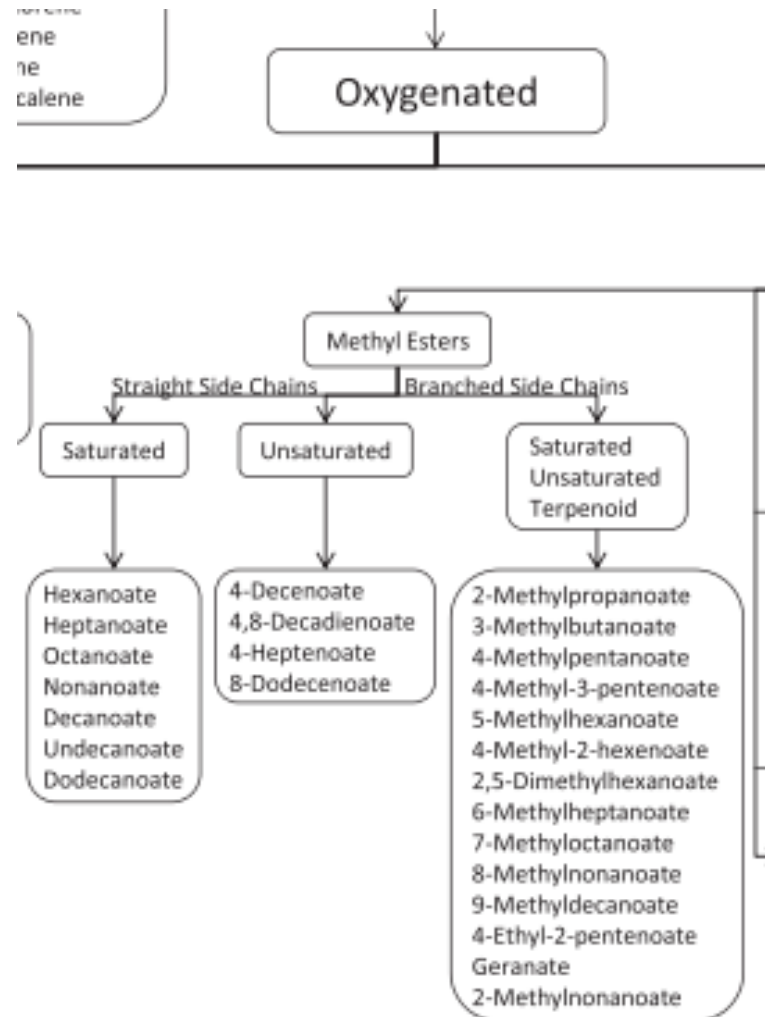
Aceites

Especiadas



Aceites

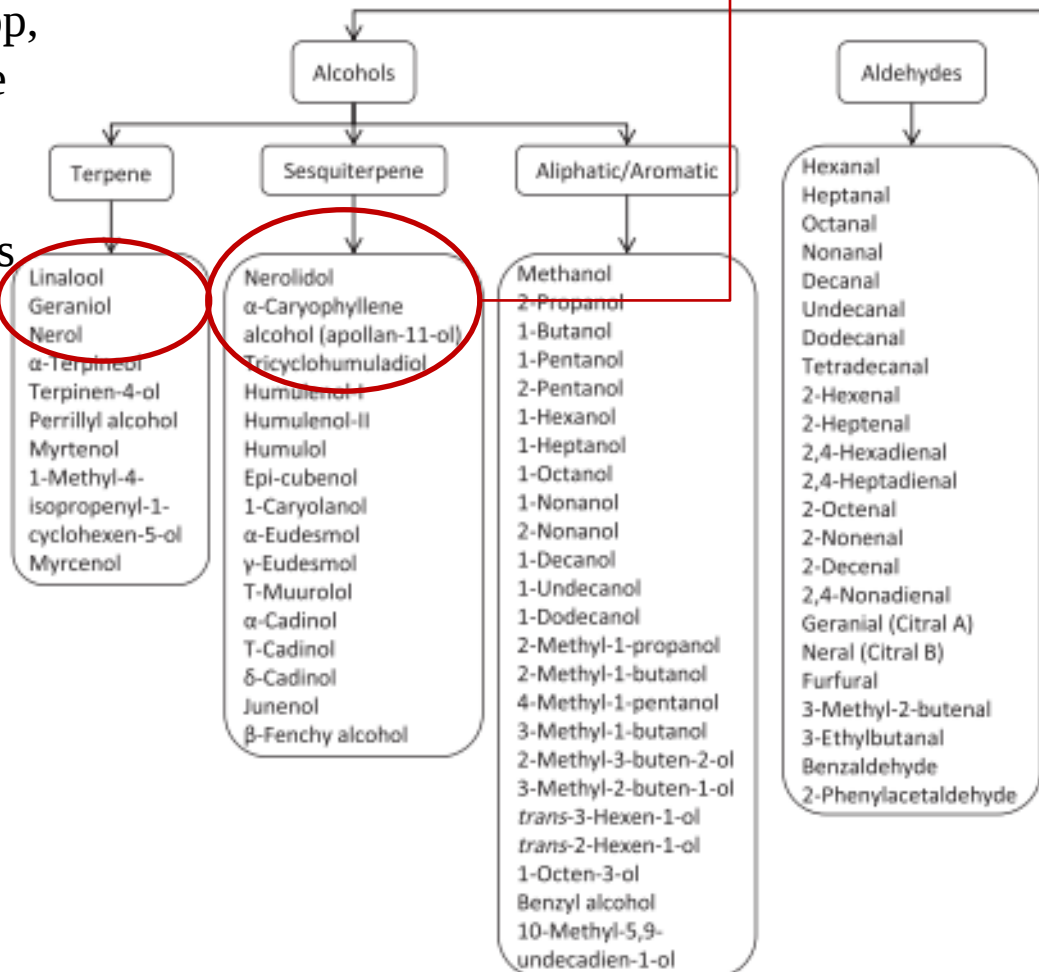
Oxigenados: contiene compuestos volátiles y otros menos volátiles. Con el tiempo algunos hidrocarbonados y algunos compuestos volátiles oxigenados se van transformando en oxigenados no volátiles.



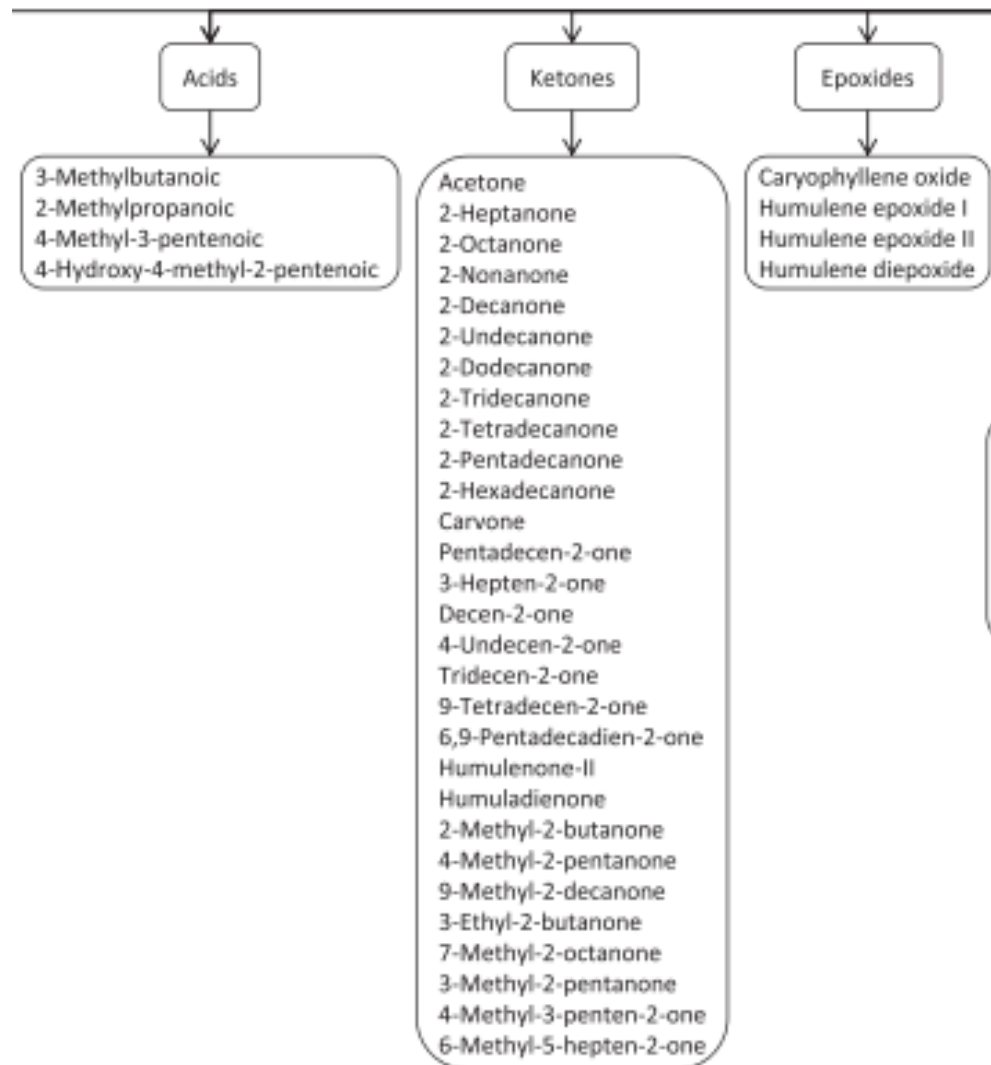
Aceites

Carácter especiado
y herbal

Puede brindar
aroma en late hop,
más temprano se
pierde.
Brinda notas
florales y cítricas

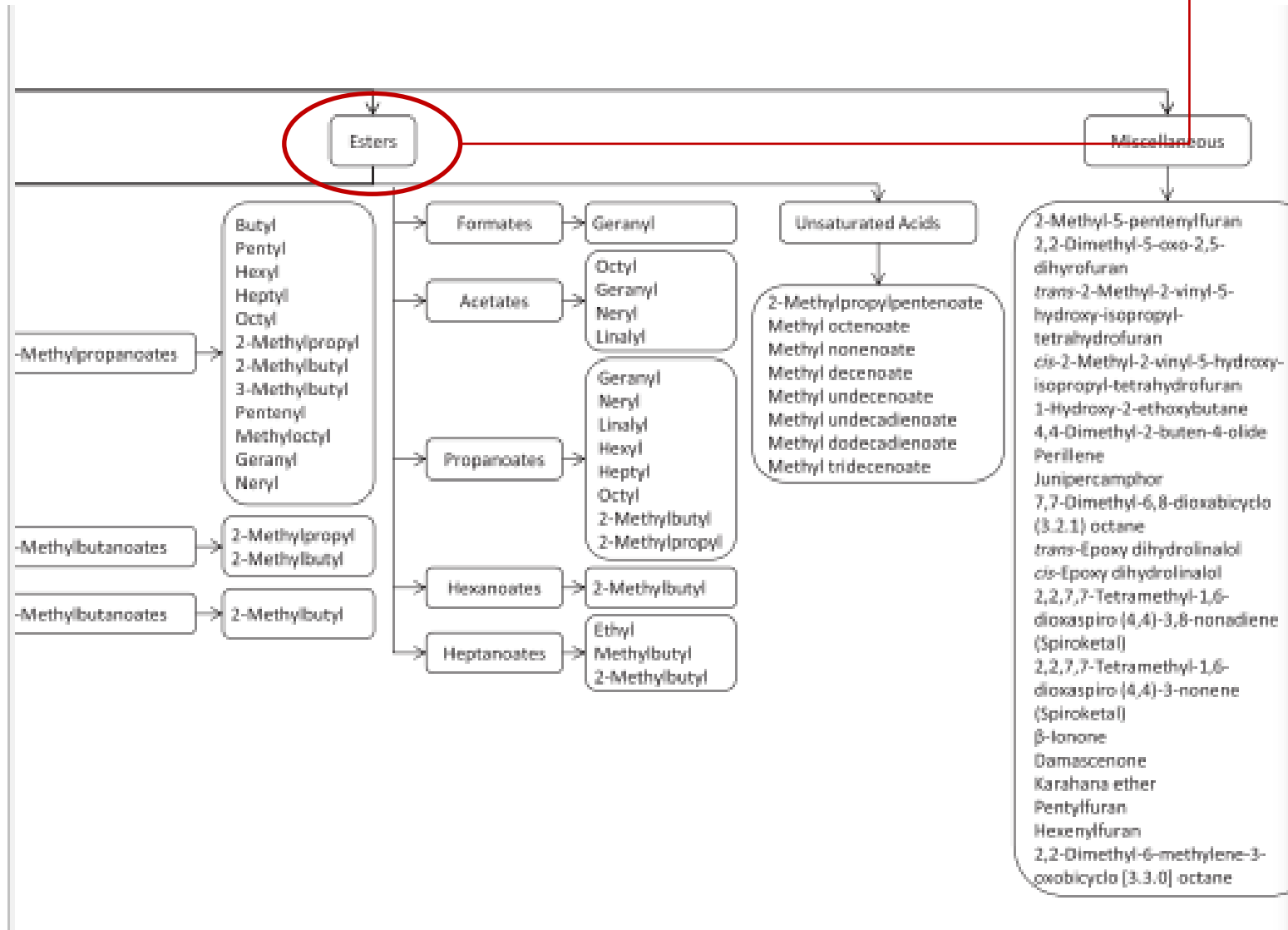


Aceites



Aceites

Frutales y florales

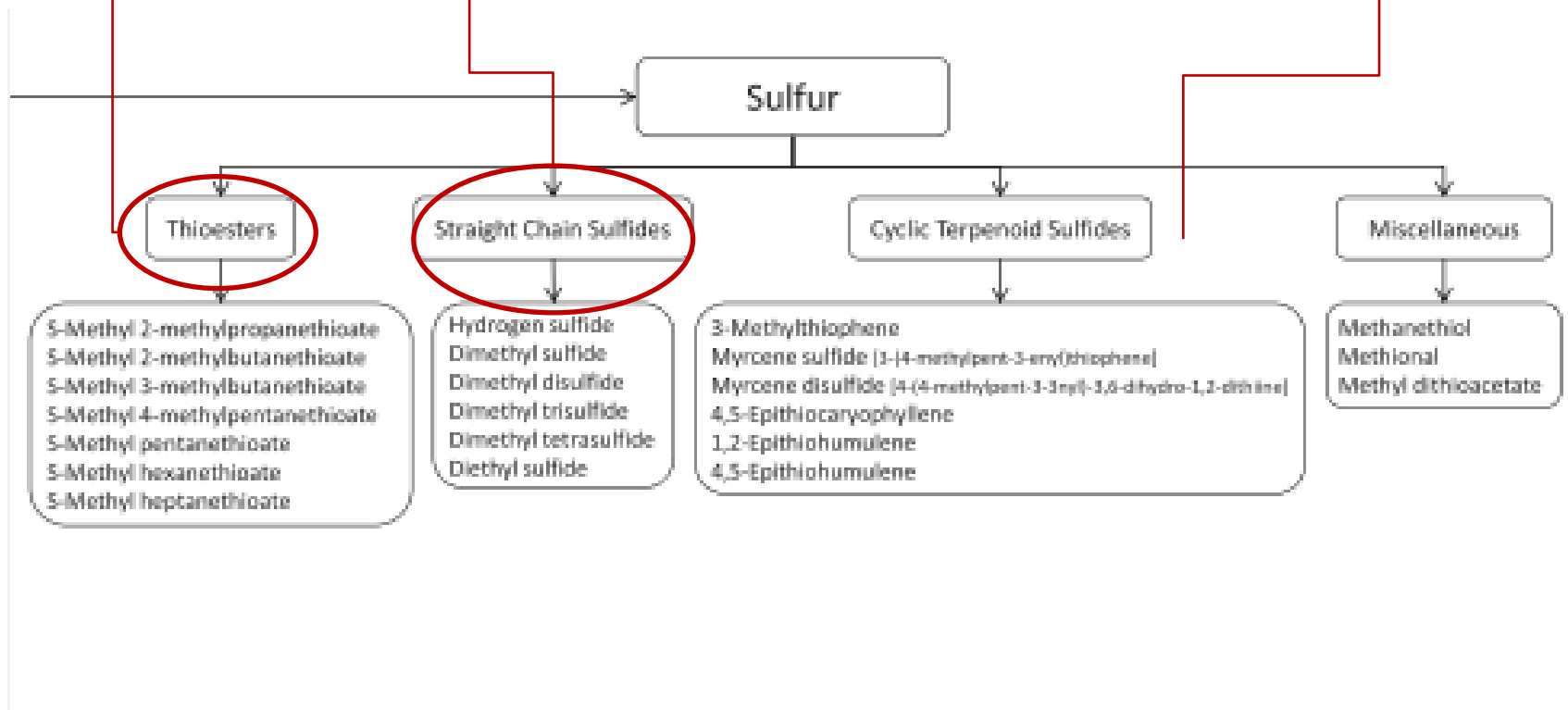


Aceites

Ajo, cebolla

Vegetales
cocidos, queso

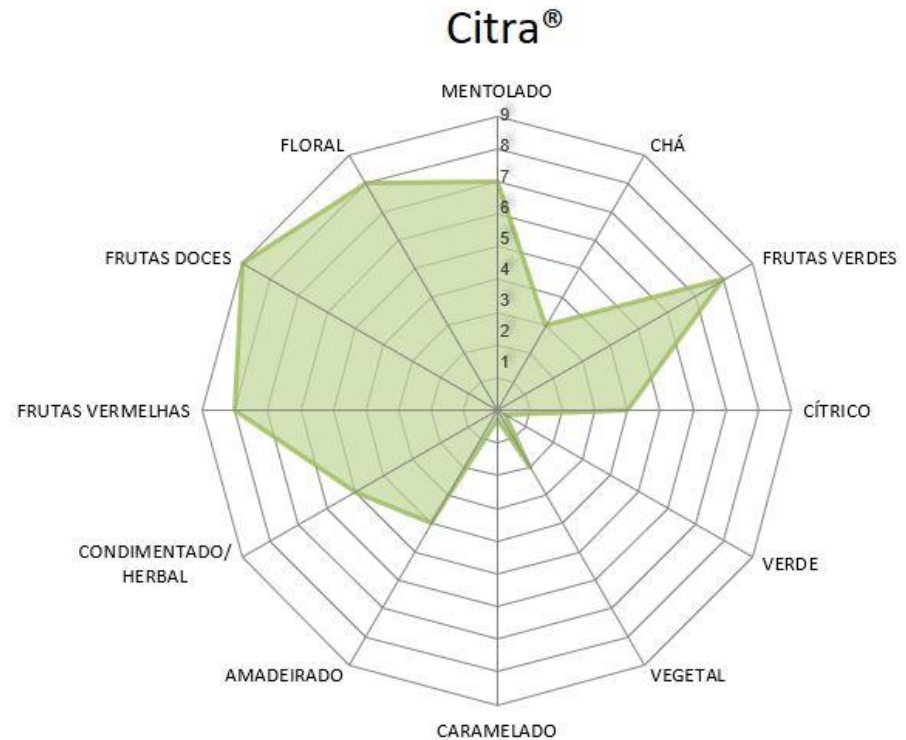
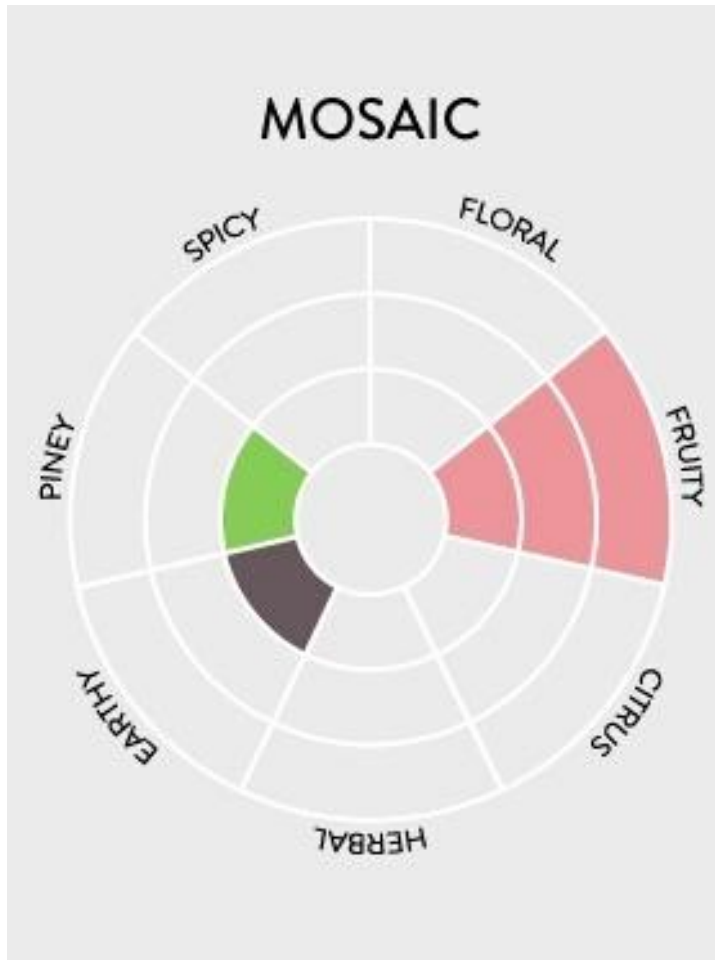
Frutas exóticas,
uva, maracuyá



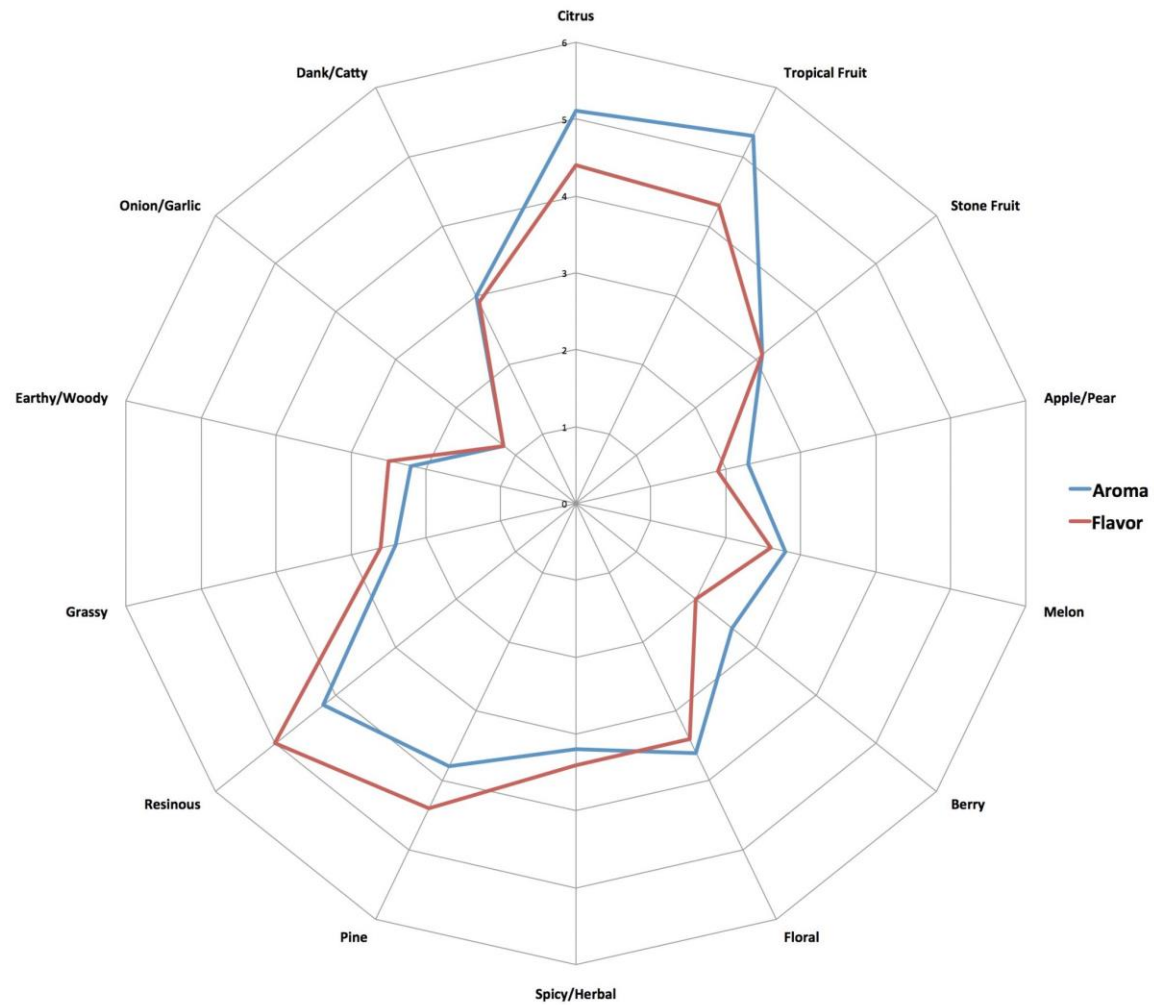
Aceites

Hop Variety	Myrcene - green, resinous	B-Pinene - spicy, piney	Humulene - piney, woody	Caryophyllene - woody	Farnesene - floral	Geraniol - floral, sweet, rose	Linalool - floral, orange	Other Oils
AHTANUM™	54.11%	0.91%	20.69%	10.05%	0.12%	0.27%	0.36%	13.51%
AMARILLO®	52.14%	0.79%	17.90%	6.53%	6.39%	0.16%	0.61%	15.48%
BITTER GOLD	53.02%	0.82%	13.49%	8.62%	0.19%	0.15%	0.54%	23.17%
Bravo	62.37%	1.02%	8.97%	6.62%	0.19%	0.50%	0.47%	19.85%
Brewers Delight	45.90%	0.76%	15.22%	8.80%	0.62%	0.28%	0.45%	27.99%
Brewers Gold	56.44%	0.84%	15.65%	9.61%	0.23%	1.34%	0.68%	15.21%
BULLION	49.11%	0.76%	18.84%	10.95%	0.43%	0.21%	0.74%	18.98%
CASCADE	56.33%	0.83%	14.19%	6.23%	6.30%	0.18%	0.49%	15.44%
Centennial	65.37%	1.09%	10.68%	5.23%	0.20%	1.14%	0.67%	15.63%
CHELAN	50.35%	0.70%	12.66%	10.09%	0.18%	0.27%	0.39%	25.36%
CHINOOK	38.21%	0.60%	18.35%	8.50%	0.30%	0.59%	0.45%	33.00%
CITRA®	66.53%	0.88%	8.73%	5.58%	0.15%	0.30%	0.77%	17.07%
Cluster	43.69%	0.67%	18.82%	8.45%	0.31%	0.83%	0.46%	26.78%
Columbus	53.20%	0.89%	11.99%	7.58%	0.23%	0.26%	0.45%	25.39%
CRYSTAL	44.67%	0.67%	26.58%	7.34%	0.12%	0.59%	0.90%	19.14%
EQUINOX™	34.09%	0.50%	19.07%	10.90%	0.29%	0.33%	0.56%	34.26%
Fuggle	24.24%	0.35%	36.37%	14.01%	6.54%	0.11%	0.78%	17.60%
Galena	47.45%	0.71%	13.53%	7.44%	0.22%	0.41%	0.42%	29.82%
Glacier	43.95%	0.58%	29.08%	9.11%	0.21%	0.23%	0.79%	16.06%
Golding	25.89%	0.36%	39.84%	12.37%	0.71%	0.09%	0.79%	19.95%
GR Brewers Gold	26.55%	0.50%	30.48%	14.61%	0.20%	1.16%	0.52%	25.98%
GR HALLERTAU	24.93%	0.34%	36.18%	10.37%	2.08%	0.26%	0.79%	25.05%
GR Herkules	44.25%	0.64%	25.62%	7.14%	0.19%	0.16%	0.27%	21.73%
GR Northern Brewer	35.47%	0.58%	32.41%	12.34%	0.30%	0.18%	0.49%	18.42%
GR PERLE	25.91%	0.40%	40.38%	14.67%	6.62%	0.06%	0.32%	11.61%
GR Tettnang	11.80%	0.22%	27.12%	7.74%	33.70%	0.14%	0.52%	28.76%
Hallertau	30.90%	0.41%	32.39%	9.64%	5.70%	0.23%	0.77%	19.97%
HORIZON	49.79%	0.70%	16.36%	11.13%	3.51%	0.22%	1.10%	17.21%
Liberty	29.94%	0.41%	37.86%	9.58%	0.55%	0.10%	1.06%	20.50%
Magnum	41.24%	0.63%	31.21%	9.98%	0.47%	0.14%	0.39%	15.94%
MILLENNIUM	44.55%	0.65%	22.20%	9.26%	0.21%	0.13%	0.55%	22.46%
MOSAIC™	61.84%	0.89%	10.62%	4.24%	0.12%	0.59%	0.69%	21.00%
MT. HOOD	41.97%	0.65%	26.80%	12.49%	0.20%	0.26%	0.83%	16.81%
Mt. Rainier	58.04%	0.78%	17.92%	7.66%	0.30%	0.29%	0.82%	14.42%
Newport	52.21%	0.79%	17.32%	9.24%	0.41%	0.20%	0.49%	19.37%
Northern Brewer	39.86%	0.66%	29.44%	13.24%	0.61%	0.15%	0.48%	15.56%
Nugget	51.15%	0.67%	18.80%	9.07%	0.26%	0.07%	1.02%	18.97%
PALISADE®	52.51%	0.83%	14.89%	11.92%	0.20%	0.25%	0.43%	18.97%
PERLE	33.04%	0.50%	35.28%	14.03%	1.03%	0.22%	0.41%	15.48%
Saaz	32.28%	0.49%	28.18%	10.78%	10.84%	0.22%	0.71%	16.49%
Santiam	24.59%	0.34%	25.81%	7.88%	17.04%	0.05%	0.87%	23.43%
SIMCOE®	50.35%	0.78%	17.42%	8.72%	0.20%	0.66%	0.61%	21.25%
SORACHI ACE	50.49%	0.75%	22.62%	7.63%	5.03%	0.31%	0.51%	12.67%
ST AURORA	36.68%	0.53%	24.16%	7.27%	6.53%	0.85%	1.00%	22.99%
ST Celena	17.60%	0.27%	32.13%	12.82%	7.15%	0.11%	0.79%	29.14%
STERLING	40.13%	0.53%	19.23%	6.66%	13.68%	0.31%	0.65%	14.89%

Los perfiles de los lúpulos



Los perfiles de los lúpulos



Ejemplo: MOSAIC

<http://brulosophy.com/2017/02/16/the-hop-chronicles-mosaic/>

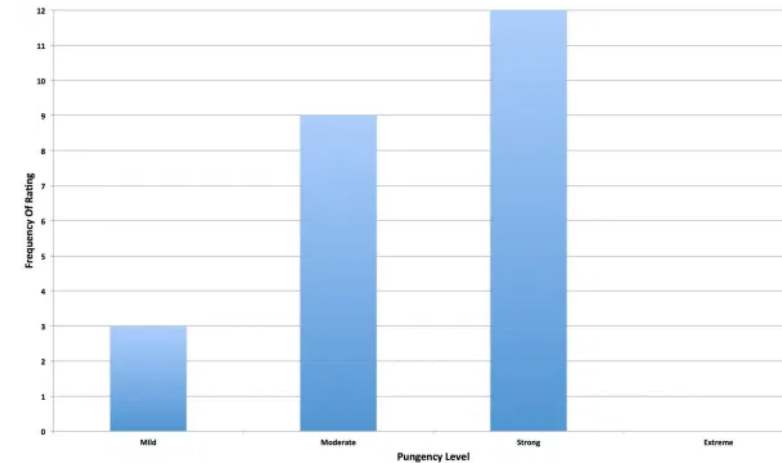
The 3 characteristics endorsed as being *most prominent* by participants:

Aroma	Flavor
Tropical Fruit	Resinous
Citrus	Citrus & Pine (tie)
Resinous	Tropical Fruit

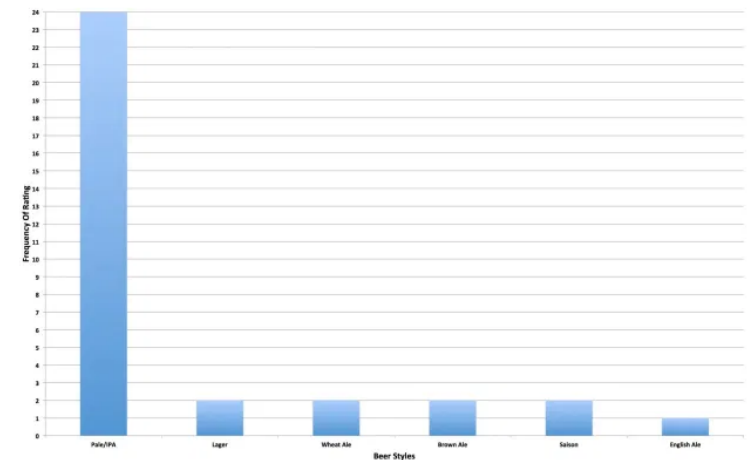
The 3 characteristics endorsed as being *least prominent* by participants:

Aroma	Flavor
Onion/Garlic	Onion/Garlic
Earthy/Woody	Apple/Pear
Apple/Pear	Berry

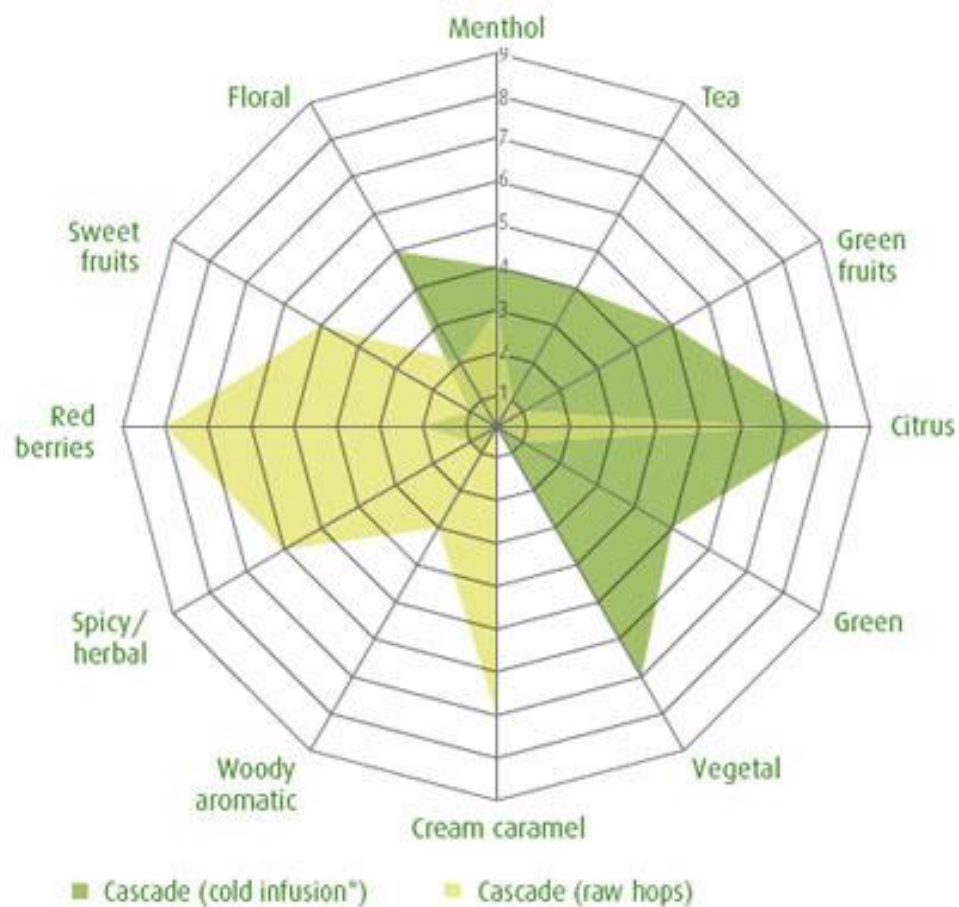
Participants were asked to rate the pungency of the hop character.



They were then instructed to identify beer styles they thought the hop would work well in.



Lúpulo vs Cerveza



El O₂: el peor enemigo

Una cerveza (especialmente lupulada) podría oxidarse en distintos momentos e instancias del proceso de elaboración:

Consumo de antioxidantes por oxidación del lado caliente

Durante la fermentación primaria si utilizara un fermentador con una tapa medio floja, o bien por ingreso de oxígeno al momento de alguna adición.

Cuánto menor es el volumen del fermentador, mayor el riesgo de oxidación
(mayor área de contacto)

Oxidación de los aceites

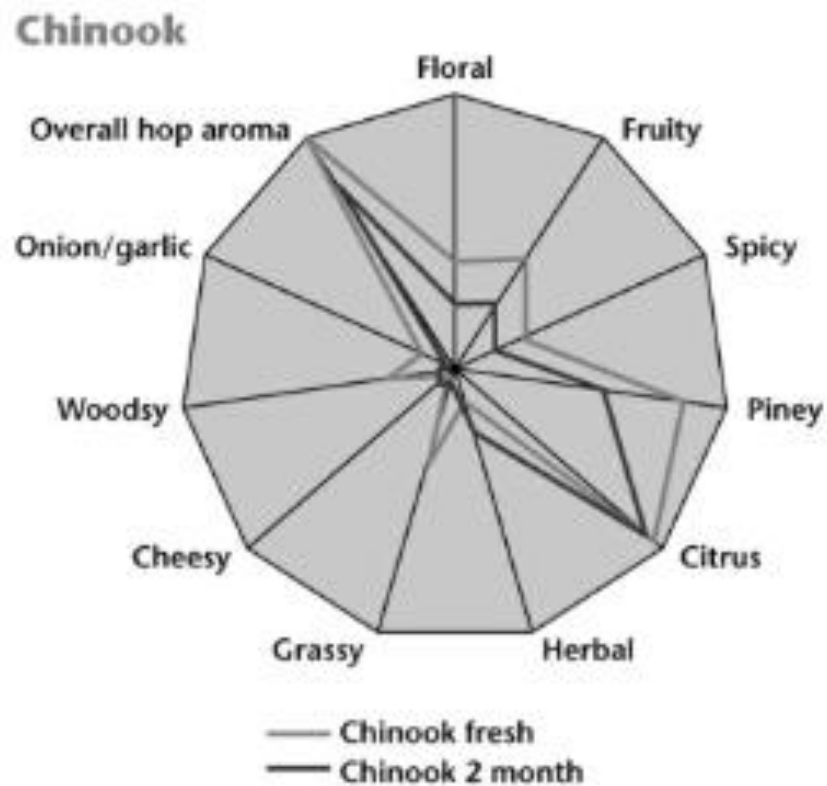
En general disminuyen los contenidos de aceites, particularmente mirceno.

Los sesquiterpenos podrían generar productos de oxidación durante el hervor que favorecerían los flavor conocidos como «kettle aroma», típicos de algunas cervezas alemanas. Se trata del aroma especiado, herbal y terroso.

La oxidación de algunos aceites de sulfuro durante el whirlpool podría causar aromas a ajo y cebolla en la cerveza.

La oxidación de otros aceites podría generar aromas de cartón húmedo, o aromas tipo caramelo o toffee.

Oxidación de los aceites





Nuestros datos

Canal de YouTube
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