

floral



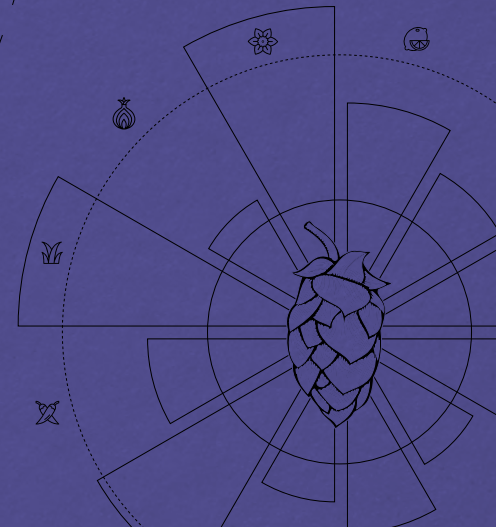
BarthHaas®

HOP HARVEST GUIDE 2022

*Master 2022 hop flavors
to create the greatest beers*

green fruits

zest fruits





Welcome to the Hop Harvest Guide

Each hop variety is unique and with each harvest year we see a variance in the respective aroma and flavor profile of a variety. Our variety guide helps you cope with these changes in especially hop-intensive beers in the brewery. By looking at the aroma profiles of your varieties compared to the average profile, you can account for strong deviations and adjust your recipe in the brewery. For the first time, our graduates of the Hop Flavorist Master Course were involved in the creation of this guide.

SOME THOUGHTS ON HARVEST 2022

Not since 2003 have we had such a poor harvest as last year. It was too hot and too dry. This means that when it comes to your hop supply in this brewing year, understanding, willingness to cooperate and creativity are required. There is a great deal of variance in the aroma profiles which could make brewing with them more challenging. Germany in particular is affected: measured against an average harvest, the 2022 harvest has a deviation of minus 26 percent by weight. The deficits for the American harvest are more moderate. There, the actual harvest quantity deviates from the expected quantity by an estimated minus ten percent. Despite the poor harvest, we at BarthHaas are working to supply our customers with the appropriate varieties and products for the desired aroma profiles.

ACTION FOR BREWERS

Brewers should definitely pay attention to hop aroma this year. As we know, alpha content and oil content correlate. A weak alpha year will also yield less aroma. Our sensory panel notes show, the fruity aromas tends to be restrained in 2022, giving way to floral, woody and menthol notes. You will likely need to be modifying hop additions in terms of quantity and timing, and also consider targeted sensory blending of hop varieties from the current harvest. Remember that our Brewing Solutions team is here to work closely with you to ensure the flavor profiles that make your beers so unique. Just write to us: brewingsolutions@barthhaas.de

Hop Harvest Guide 2022

The ultimate guide to making the greatest beers from the 2022 hop harvest



Hop Harvest Guide 2022

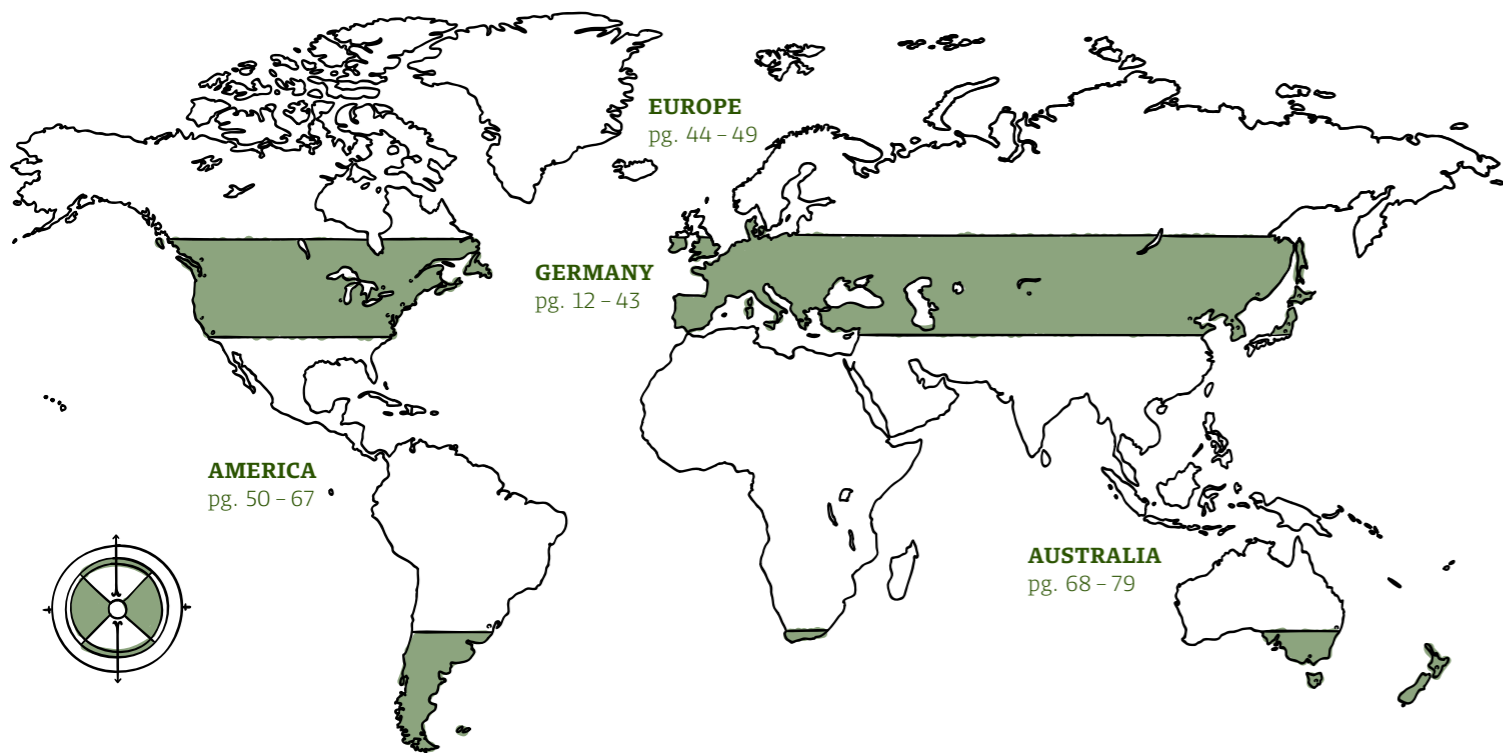


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A short guide to understanding hop aroma

ABOUT VARIETIES, AROMA AND FLAVOR

There are almost 300 different hop varieties worldwide to choose from. Every one of them possesses a unique aroma and flavor. Many of those varieties hold undiscovered potential for exciting aromas in hop forward beers. The success of hop forward craft beers worldwide continues. New beer styles are being created, in which hops undoubtedly play the main role. For brewers, it is more important than ever to know and realize the potential of their ingredients.

Many analytical values have been established to describe hops. The alpha acid content is important to calculate the bitterness in beer. The oil content is an important parameter for hop aroma dosing in the brewing process. However, that is not the full story, as the hop aroma in beer cannot be reduced to one or a few measurable values. The composition of hops, hop oil and hop aroma is simply too complex. Does it make sense to analyse so many hop aroma compounds?



WHICH COMPOUNDS CAN BE FOUND IN HOP OIL?

With the addition of hops, potentially more than 800 aroma components are added to beer, of which only 485 have been identified to be found in beer. Depending on their molecular nature, the single components differ in volatility, especially at higher temperatures, and solubility. The most important hop aroma compounds, their quantitative proportion, and also their role in hop flavor are described in the next few paragraphs.

MYRCENE is a terpene and the main hop oil component in most hop varieties. It is responsible for a green, hoppy aroma. However, its low solubility and high volatility mean that only small amounts are transferred into and retained in beer, primarily when dry-hopping. Measuring myrcene makes sense, as it shows you which proportion of the hop oil will most likely NOT end up in beer.

HUMULENE, CARYOPHYLLENE and **FARNESENE** are the main sesquiterpenes in hop oil. They impart herbal, woody, spicy, and sometimes citrusy or floral aromas. Like myrcene, they are present in beer only in low concentrations due to their low solubility and high volatility. The ratio of caryophyllene to humulene and the presence or absence of farnesene are considered characteristic markers for different hop varieties. The measurement of these components makes sense, as the potential for herbaceous and spicy aromas and flavors is connected to these compounds and their oxidized versions.



LINALOOL and **GERANIOL** are the two most abundant **TERPENE ALCOHOLS** in hops. Terpene alcohols are more soluble than terpenes or sesquiterpenes and so play a major role in both late hop and dry-hopping aroma. Linalool is generally described as floral and citrusy, reminiscent of lavender or bergamot, and geraniol as floral with a hint of citrus, rose or geranium. Other terpene alcohols and **TERPENE ESTERS** can impart floral, woody, or spicy notes. The measurement of these components shows you the potential floral and citrus notes. These components, however, are of lower sensory importance as soon as thiols are also present.

Hop **KETONES** and **ISOBUTYRATES** also show good solubility and impart fruity, sometimes waxy notes, contributing to banana or pineapple flavors. The measurement of these components makes sense as it gives an indication of potential sweet fruit notes. These components, however, are also of lower sensory importance as soon as thiols are present.

THIOLS, specifically 4-mercapto-4-methylpentan-2-one (4MMP), 3-mercaptohexan-1-ol (3MH), and 3-mercaptohexyl acetate (3MHA), are present only in very small concentrations in hops but due to their extremely low sensory detection thresholds, they can have a major impact on hop aroma perception. 4MMP is usually described as tasting of blackcurrant or ribes or, to some people, "catty". 3MH and 3MHA impart tropical notes of passion fruit or guava. Measuring these components gives you a good idea of the overall fruity intensity of your beer and the potential for exhibiting tropical fruit notes. However, not many laboratories offer these analyses and they are very cost intensive.

THRESHOLDS AND AROMA INTENSITY

Sensory threshold values for hop aroma components determined so far range from 4 ng/L up to 200 mg/L, which is the factor of 50 million! It is known today that individual thresholds change in solutions as soon as there are other compounds present. In a mixture with other aroma components, the thresholds shift and can lead to synergistic but also masking effects.

Thiols play an important role here. In their free form, we find them predominantly in US and Australian varieties but not in European hops. Their thresholds are very low and so is their concentration in hops and in beer compared to other aroma compounds. This means that they don't contribute significantly to the total amount of hop oil, but they are dominant in a sensory context.

For example, you may be able to pick up a large difference in aroma intensity when dry-hopping with Hallertau Mittlefrueh at either 2 ml or 4 ml of hop oil per hl of beer. When using US Cascade hops, that contain a higher concentration of thiols compared to Hallertau Mittelfrüh, this intensity difference between the two dosages may not be as large due to the presence of thiols.

Instead of trusting a gas chromatograph, we should trust our olfactory system.

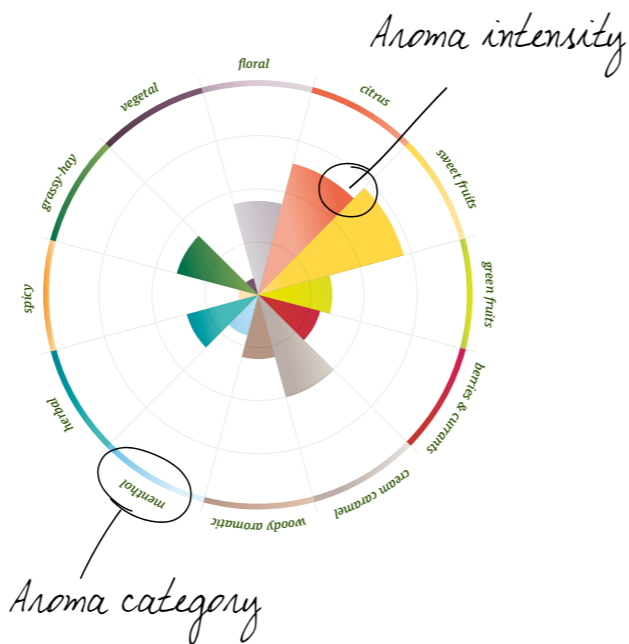
For a few years now we have been offering sensory training to brewers using our HOPSESSED® language. We work with 12 categories and within these categories we have more than 100 specific descriptors e. g. grapefruit, lavender, pineapple, etc. All categories are rated with intensity values for each hop variety or hoppy beer, which leads to a very precise hop aroma profile. With the help of these profiles, brewers can design recipes and determine their aroma hop dosage.

HOPSESSED®

The language of hops

HOPSESSED® ROSECHART

The right flavor at a glance: We have visualized the new sensory language for you. Our Hop Navigator will guide you easily and quickly.



HOPSESSED® CATEGORY DESCRIPTIONS

The 12 aroma categories and associated aromas allow you to define your unique aroma profile.



floral

elderflower, chamomile blossom, lily of the valley, jasmine, apple blossom, rose, geranium, carnation, lily, lilac, lavender, osmanthus



citrus

grapefruit, orange, lime, lemon, bergamot, lemon-grass, ginger, tangerine, pomelo



sweet fruits

banana, watermelon, honeydew melon, peach, apricot, passion fruit, lychee, dried fruit, plum, pineapple, cherry, kiwi, mango, guava



green fruits

pear, apple, quince, gooseberry, white wine grapes



berries & currants

cassis, blueberry, raspberry, blackberry, strawberry, red currant, blackcurrant, wild strawberry, cranberry, mulberry



cream caramel

butter, chocolate, yogurt, honey, cream, caramel, toffee, coffee, tonka bean, vanilla, coconut



woody aromatic

tobacco, cognac, barrique, leather, woodruff, incense, myrrh, resin, cedar, pine, earthy



menthol

mint, lemon balm, sage, camphor, menthol, wine yeast, eucalyptus



herbal

lovage, marjoram, tarragon, dill, parsley, basil, fennel, cilantro, rosemary, thyme, green tea, black tea, mate tea, oregano



spicy

pepper, chili, curry, juniper, aniseed, liquorice, fennel seeds, clove, cinnamon, gingerbread, coriander seeds, nutmeg



grassy-hay

fresh cut grass, hay, tomato leaves, green pepper, nettle, cucumber, bamboo leaves



vegetal

celery, leek, onion, artichoke, garlic, wild garlic, radish



Ariana

Harvest 2022



Key Flavors 2022



This variety was bred under the designation 2010/72/20 in the hop research center in Huell. It was first commercially harvested in 2016. Ariana is a daughter of the popular high-alpha variety Herkules. The name is derived from a female name.

ANALYSIS VALUES

Growing area	Germany
Heritage	Herkules x wild male variety
Alpha Acids*	8.0 - 13.0 %
Total Polyphenols	3.0 - 4.5 %
Total Oil	1.0 - 1.7 ml/100 g
Beta Acids	4.8 - 5.5 %

% OF TOTAL OIL

Myrcene	45.0 - 50.0 %	Geraniol	0.1 - 0.2 %
Linalool	0.2 - 0.5 %	Terpene esters & -alcohols	2.0 - 3.0 %
Humulene	15.0 - 20.0 %	Ketones	3.0 - 4.0 %
Caryophyllene	4.0 - 5.0 %	Isobutyrate	1.0 - 2.0 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	7.0 - 11.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

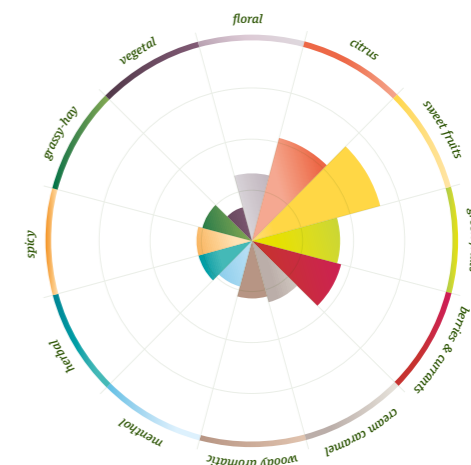
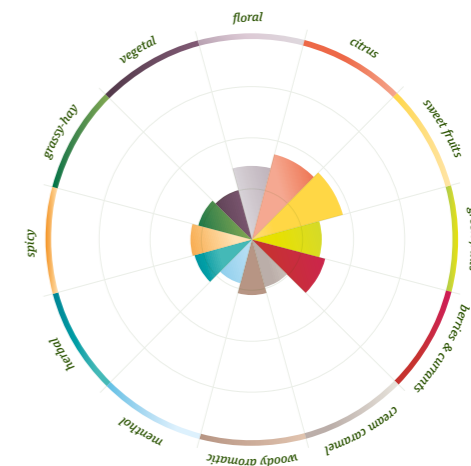
Ariana shows itself to be a multi-fruit variety, enticing with sweet fruits like passion fruit and pineapple. This sweetness is balanced with notes of grapefruit and lime.

i For your brewing: The characteristic sweet fruits and citrus of Ariana are somewhat lower in 2022. You can substitute a portion with LUPOMAX® pellets of this variety or you can add another variety (US or Australia) in your recipe that is similar in these categories.

TYPICAL AROMA PROFILE

This hop variety is dominated by sweet fruit and berry aromas – a multi-fruit cocktail of passion fruit, pineapple, tangerine, lime, quince, strawberry and blackberry.

Average Key Flavors since 2018



Callista

Harvest 2022



Key Flavors 2022



This variety was bred in Huell under the name 2010/008/033. It is a descendant of exclusively German varieties. The first year with a commercial harvest was 2016. Callista can mean many things, but is most often associated with the Greek word meaning "the most beautiful (female)".

ANALYSIS VALUES

Growing Area	Germany
Heritage	Hallertau Tradition x wild male variety from Huell
Alpha Acids*	2.0 - 5.0 %
Total Polyphenols	3.9 - 5.2 %
Total Oil	1.2 - 2.1 ml/100 g
Beta Acids	4.8 - 7.0 %

% OF TOTAL OIL

Myrcene	47.0 - 63.5 %	Geraniol	no data
Linalool	1.2 - 1.3 %	Terpene esters & -alcohols	1.0 - 1.3 %
Humulene	16.0 - 20.0 %	Ketones	0.6 - 1.0 %
Caryophyllene	3.0 - 7.0 %	Isobutyrate	0.2 - 1.0 %
Farnesene	0.1 - 0.3 %	Thiols (µg/kg)	7.0 - 10.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

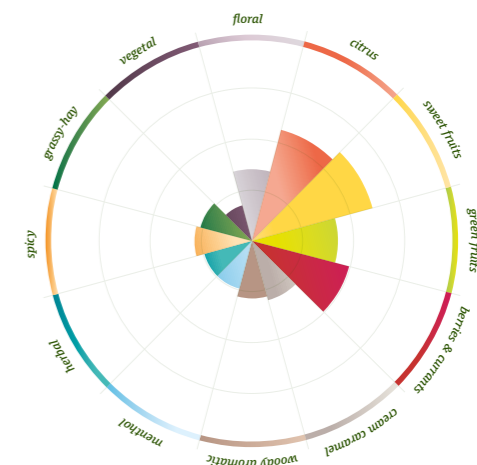
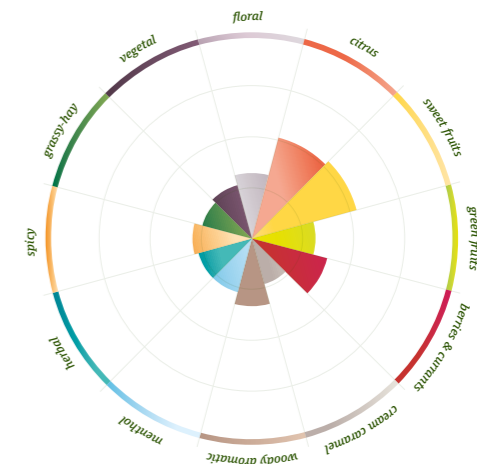
Aroma of citrus fruits like grapefruit and orange combine with passion fruit and Mango to form a delicious fruit cocktail. There are some onion flavors that might potentially make Callista even more fruity in beer.

i For your brewing: The characteristic sweet fruits and citrus of Callista are somewhat lower in 2022. You can substitute a portion with LUPOMAX® pellets of this variety or you can add another variety (US or Australia) in your recipe that is similar in these categories.

TYPICAL AROMA PROFILE

Callista offers a fruit cocktail of berries, sweet fruits and citrus fruits, with pear, blackberry, strawberry and blackcurrant mixed with passion fruit, orange and caramel.

Average Key Flavors since 2018



Comet

Harvest 2022



Key Flavors 2022



Comet was released in the US in 1961. It was bred as a high alpha acid variety for the growing areas in Washington and Idaho from English and American breeding stock. Comet is characterized by its unusually large cones that smell distinctly of elderflower. Today, Comet is is grown by only a few hop farmers.

ANALYSIS VALUES

Growing Area	Germany
Heritage	open pollination
Alpha Acids*	9.4 - 12.4 %
Total Polyphenols	no data
Total Oil	1.4 - 3.3 ml/100 g
Beta Acids	3.0 - 6.1 %

% OF TOTAL OIL

Myrcene	40.0 - 65.0 %	Geraniol	0.4 %
Linalool	0.4 %	Terpene esters & -alcohols	0.4 %
Humulene	1.2 %	Ketones	1.6 %
Caryophyllene	16.0 %	Isobutyrate	0.2 %
Farnesene	< 0.1 %	Thiols (µg/kg)	10.3

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

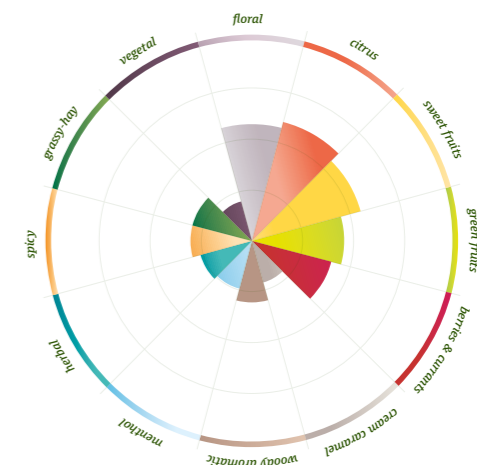
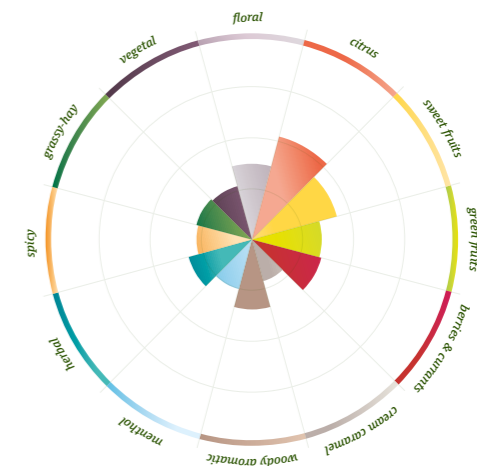
Normally Comet is a variety you can rely on. However the extraordinary notes of elderflower are less present this year. This year, sweet passion fruit and citrus notes give Comet a special note.

i For your brewing: The floral, sweet fruits, berry and citrus characters of Comet are considerably lower in 2022. You can substitute a portion with LUPOMAX® pellets of a variety strong in these characters or you can add another variety (US or Australia) in your recipe that is similar in these categories.

TYPICAL AROMA PROFILE

This hop combines lemon, passion fruit and lemongrass aromas with guava, elderflower and quince, rounded off with resinous notes.

Average Key Flavors since 2018



Hallertau Blanc

Harvest 2022



Key Flavors 2022



This variety, released in 2012, was bred in Huell from Cascade and a male Huell. It shows a high resistance to mildew. Hallertau Blanc is one of the varieties which were bred in response to demand from the craft beer industry and its desire for bold tastes and differentiating flavors. It matures late and has a distinct white wine-like bouquet.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Daughter of Cascade
Alpha Acids*	9.0 - 11.0 %
Total Polyphenols	no data
Total Oil	1.5 - 1.8 ml/100 g
Beta Acids	4.0 - 7.0 %

% OF TOTAL OIL

Myrcene	50.0 - 70.0 %	Geraniol	0.2 %
Linalool	0.3 - 0.5 %	Terpene esters & -alcohols	0.2 %
Humulene	1.0 %	Ketones	0.6 %
Caryophyllene	1.1 %	Isobutyrate	0.8 %
Farnesene	< 0.1 %	Thiols (µg/kg)	5.7

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

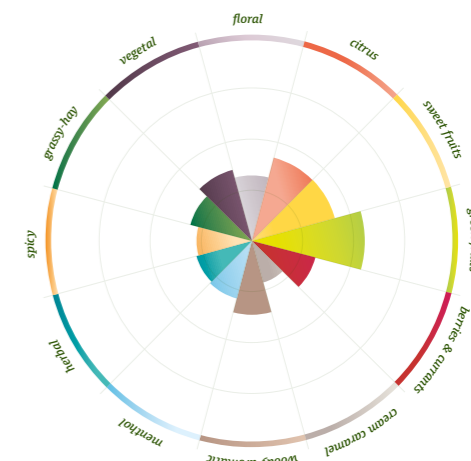
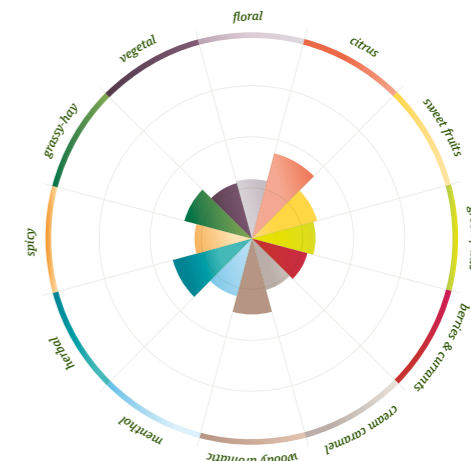
The white wine-like and sulphuric-grapefruit aromas together with a hint of lemongrass supplement gooseberry and cucumber to give you the refreshing bouquet of 2022 Hallertau Blanc.

i For your brewing: The very characteristic green fruits of Hallertau Blanc are considerably lower in 2022. If you have enough Hallertau Blanc from a different harvest, blend the pellets from the different harvests. Another similar variety is Nelson Sauvin from New Zealand. Another possibility would be to substitute a small portion with Galaxy® or Ella™ from Australia.

TYPICAL AROMA PROFILE

Hallertau Blanc is characterized by its green fruit (white muscatel grape) aroma, combined with citrusy grapefruit and elderflower notes, and complemented by lemongrass and cucumber.

Average Key Flavors since 2018



Hallertauer Magnum

Harvest 2022



Key Flavors 2022



This variety, named for its unusually large and heavy cones, is a high alpha variety from Huell. It is characterized by good yields and a high tolerance towards diseases. Its ideal harvest date lies in the middle of harvest season.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Daughter of US Galena
Alpha Acids*	12.3 - 15.2 %
Total Polyphenols	no data
Total Oil	2.0 - 3.2 ml/100 g
Beta Acids	no data

% OF TOTAL OIL

Myrcene	45.9 %	Geraniol	0.2 %
Linalool	0.4 %	Terpene esters & -alcohols	0.3 %
Humulene	27.4 %	Ketones	1.7 %
Caryophyllene	7.6 %	Isobutyrate	0.8 %
Farnesene	< 0.1 %	Thiols (µg/kg)	2.3

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

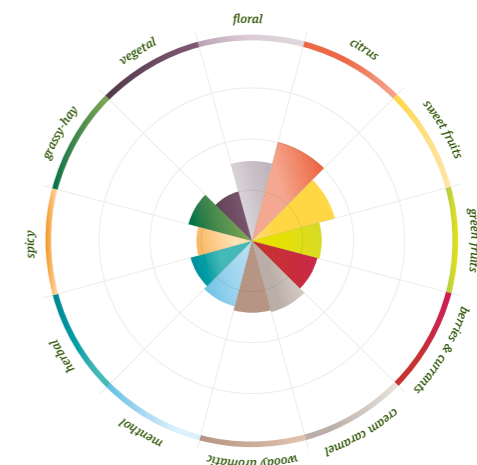
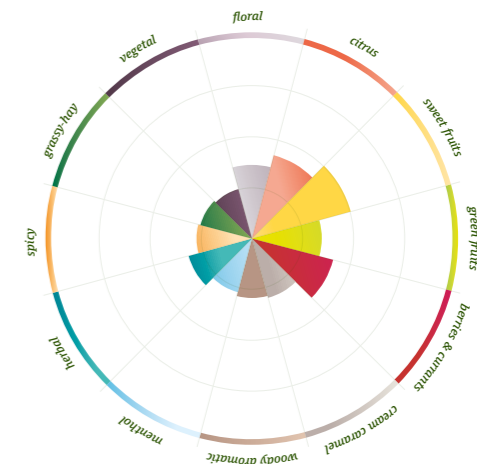
In 2022 Magnum delivers stronger sweet fruit and citrus notes. This hop variety retains the peppery and resinous notes that are unmatched in Europe.

i For your brewing: The characteristic citrus and orange flavor of Hallertauer Magnum is considerably lower in 2022. Magnum is rarely used for its aroma characteristic, but if you do use it for its aroma, you can add another variety with a strong citrus flavor.

TYPICAL AROMA PROFILE

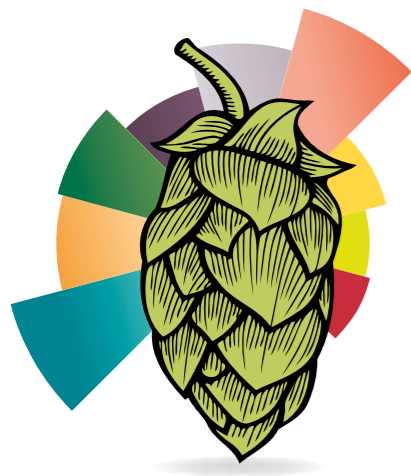
Hallertauer Magnum dominates with aromas of cool mint and sweet fruit which are complemented with peppery herbal and resinous notes.

Average Key Flavors since 2018



Hallertau Mittelfrueh

Harvest 2022



Key Flavors 2022



Hallertau Mittelfrueh is a very popular variety with a fine aroma and average bitter acid content. Because of its high susceptibility to wilt, this variety suffered from a dramatic decrease in cultivation for some time. However, due to increasing demand in the early 2000s, Hallertau Mittelfrueh experienced a comeback.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Landrace variety
Alpha Acids*	3.0 - 5.5 %
Total Polyphenols	4.0 - 5.0 %
Total Oil	0.7 - 1.4 ml/100 g
Beta Acids	3.0 - 5.0 %

% OF TOTAL OIL

Myrcene	20.0 - 52.0 %	Geraniol	0.2 - 0.4 %
Linalool	0.6 - 0.8 %	Terpene esters & -alcohols	0.7 - 0.9 %
Humulene	22.0 - 23.0 %	Ketones	1.0 - 1.1 %
Caryophyllene	6.0 - 7.0 %	Isobutyrate	0.5 - 0.7 %
Farnesene	3.0 - 4.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

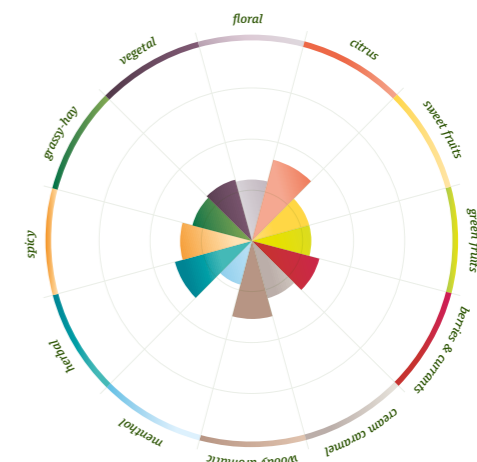
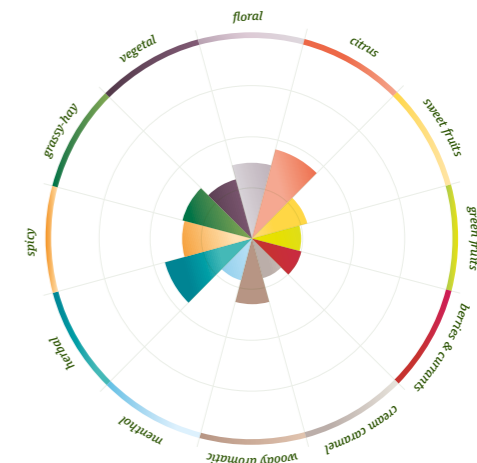
The graceful land variety Hallertau Mittelfrueh gives us another year in which it entices us with splendid aromas. This year the scents of rose and lime are underscored by grassy and resinous-woody notes.

i For your brewing: The characteristic balanced aroma profile of Hallertau Mittelfrueh is comparable to the average profile - the floral character is stronger than usual. There is no need to change anything in your brewing recipes when using Hallertau Mittelfrueh.

TYPICAL AROMA PROFILE

This variety's aroma is characterized by spicy-woody aromas like myrrh, carnation and lilac combined with red currant and lemon.

Average Key Flavors since 2018



Hallertauer Tradition

Harvest 2022



Key Flavors 2022



As the traditional variety Hallertau Mittelfrueh was endangered due to its high susceptibility to wilt, a successor with similar brewing properties was sought. Hallertau Tradition successfully replaced the highly wilt-susceptible landrace variety Hallertau Mittelfrueh in both agronomic and brewing trials in 1992. Its broad pest resistance and reliable yields make it very popular.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Hallertauer Gold x 75/15/106
Alpha Acids*	4.0 - 7.2 %
Total Polyphenols	4.0 - 5.0 %
Total Oil	0.5 - 1.0 ml/100 g
Beta Acids	3.0 - 6.0 %

% OF TOTAL OIL

Myrcene	17.0 - 36.0 %	Geraniol	no data
Linalool	0.7 - 1.2 %	Terpene esters & -alcohols	0.9 - 1.1 %
Humulene	32.0 - 37.0 %	Ketones	0.9 - 1.1 %
Caryophyllene	8.0 - 10.0 %	Isobutyrate	0.7 - 0.9 %
Farnesene	0.1 - 0.7 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

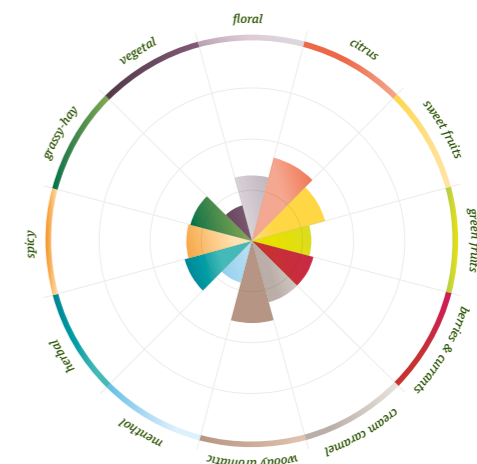
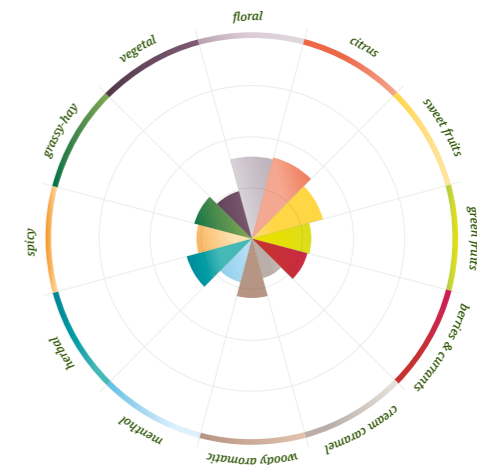
As is typical, Tradition shines with lemony and herbal notes of lemon and oregano. This year, these aromas are rounded out by apricot. Woody barrique and Christmas-like gingerbread complement this aroma harmoniously.

i For your brewing: The characteristic balanced aroma profile of Hallertau Tradition is comparable to the average profile - the creamy and woody character is less pronounced than usual. There is no need to change anything in your brewing recipes when using Hallertau Tradition.

TYPICAL AROMA PROFILE

Hallertauer Tradition shows off mostly citrusy and lime aromas combined with woody, herbal and green-grassy notes.

Average Key Flavors since 2018



Hersbrucker Spaet

Harvest 2022



Key Flavors 2022



Hersbrucker Spaet is a traditional variety with a balanced aroma and a low alpha acid content. The variety is robust with good tolerance to diseases, it is susceptible to peronospora.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Landrace variety
Alpha Acids*	2.4 - 2.8 %
Total Polyphenols	4.0 - 5.0 %
Total Oil	1.0 - 1.2 ml/100 g
Beta Acids	4.0 - 5.0 %

% OF TOTAL OIL

Myrcene	no data	Geraniol	no data
Linalool	no data	Terpene esters & -alcohols	no data
Humulene	no data	Ketones	no data
Caryophyllene	no data	Isobutyrate	no data
Farnesene	no data	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

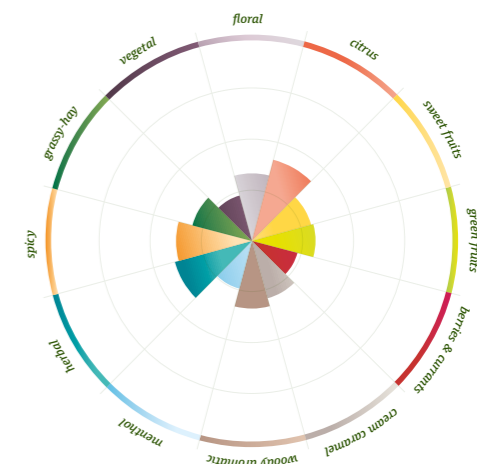
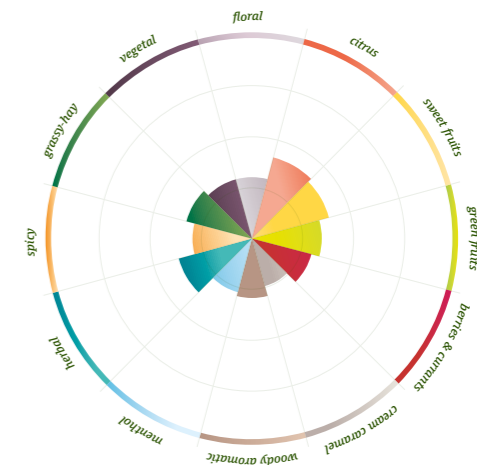
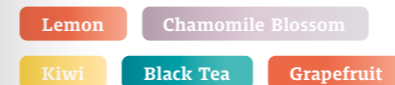
In 2022 Hersbrucker Spaet is a well-balanced hop variety. Lemony freshness is complemented by chamomile and rounded off with a slight pineapple fruitiness.

i For your brewing: The characteristic balanced aroma profile of Hersbrucker Spaet is comparable to the average profile – the herbal character is less pronounced than usual. There is no need to change anything in your brewing recipes when using Herbrucker Spaet.

TYPICAL AROMA PROFILE

Hersbrucker Spaet is typical by combining herbal and spicy aromas of parsley and lovage with citrusy aromas of kiwi and lemon.

Average Key Flavors since 2018



Herkules

Harvest 2022



Key Flavors 2022



Herkules is a robust, high-yielding, high alpha bittering hop cultivar tolerant to various diseases. It was released in 2006 by the Hop Research Center Huell. Like the hero of Greek mythology, it is an all-rounder combining excellent brewing qualities with a high disease resistance, strong yields and very good storage stability.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Daughter of Taurus
Alpha Acids*	15.2 - 17.5 %
Total Polyphenols	3.0 - 4.0 %
Total Oil	1.6 - 2.4 ml/100 g
Beta Acids	4.0 - 5.5 %

% OF TOTAL OIL

Myrcene	30.0 - 55.0 %	Geraniol	0.3 - 0.5 %
Linalool	0.1 - 0.3 %	Terpene esters & -alcohols	0.6 - 0.8 %
Humulene	16.0 - 18.0 %	Ketones	1.1 - 1.3 %
Caryophyllene	4.0 - 5.0 %	Isobutyrate	2.8 - 3.0 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	5.0 - 5.2

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

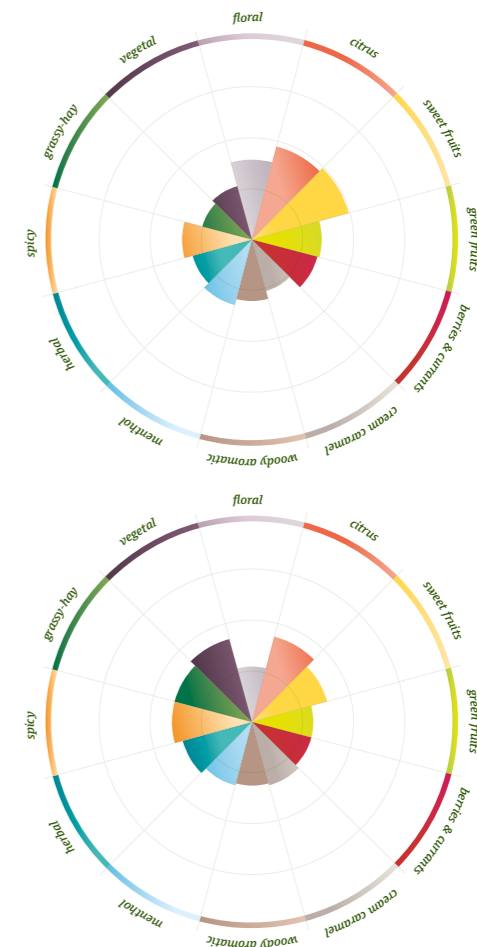
Already a venerable variety, but not yet exhausted its potential. Fresh lemon balm and Orange complete floral notes of geranium. Pine and black tea ground the freshness.

i For your brewing: The characteristic aroma profile of Herkules is comparable to the average profile, the citrus and sweet fruits characters are a little more pronounced than the other characters. There is no need to change anything in your brewing recipes when using Herkules.

TYPICAL AROMA PROFILE

Herkules is typically green-grassy, herbal and spicy, reminiscent of tomato leaves and bell peppers.

Average Key Flavors since 2018



Huell Melon

Harvest 2022



Key Flavors 2022



Huell Melon was bred in Huell from Cascade and a male breeding line and originally carried the number 2009/02/076. It shows broad disease resistance and medium yields and is harvested late in the season. It possesses a distinctive honeydew melon and strawberry aroma.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Daughter of Cascade
Alpha Acids*	5.8 - 7.8 %
Total Polyphenols	3.3 - 4.5 %
Total Oil	1.3 - 1.8 ml/100 g
Beta Acids	8.1 - 9.3 %

% OF TOTAL OIL

Myrcene	40.0 - 55.0 %	Geraniol	1.0 - 1.2 %
Linalool	0.2 - 0.4 %	Terpene esters & -alcohols	0.0 - 0.1 %
Humulene	0.6 - 1.0 %	Ketones	0.7 - 1.0 %
Caryophyllene	1.0 - 3.0 %	Isobutyrate	4.0 - 5.0 %
Farnesene	7.0 - 10.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

This year Huell Melon delivers the typical aroma of strawberry and caramel which is strongly reminiscent of candy. However this year the aromas are slightly suppressed.

i For your brewing: The characteristic fruity profile of Huell Melon is similar but all characters are considerably lower in 2022. We recommend to work with the LUPOMAX® pellets of this variety.

TYPICAL AROMA PROFILE

Huell Melon is full of fruit with melon, wild strawberry and peach tea aromas, rounded off with creamy yogurt notes and complemented by herbal-spicy and floral aromas of lemon balm, aniseed, lavender and geranium.

Average Key Flavors since 2018



Mandarina Bavaria

Harvest 2022



Key Flavors 2022



This variety was bred from Cascade and Huell breeding line 2007/18/13 and was released in 2012. It delivers on its name, offering a strong citrusy aroma. Its drought resistance and late harvest window make it an attractive variety for growers.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Daughter of Cascade
Alpha Acids*	7.6 - 10.2 %
Total Polyphenols	3.1 - 4.0 %
Total Oil	1.5 - 1.8 ml/100 g
Beta Acids	6.1 - 7.3 %

% OF TOTAL OIL

Myrcene	28.0 - 33.0 %	Geraniol	0.2 - 0.4 %
Linalool	0.1 - 0.3 %	Terpene esters & -alcohols	1.2 - 1.7 %
Humulene	12.0 - 16.0 %	Ketones	0.7 - 0.9 %
Caryophyllene	2.0 - 5.0 %	Isobutyrate	1.2 - 1.6 %
Farnesene	1.0 - 3.0 %	Thiols (µg/kg)	6.0 - 8.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

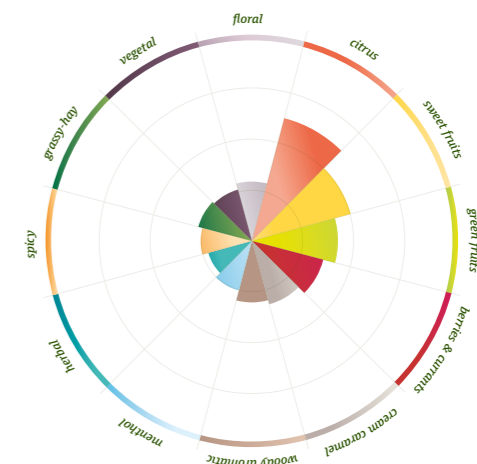
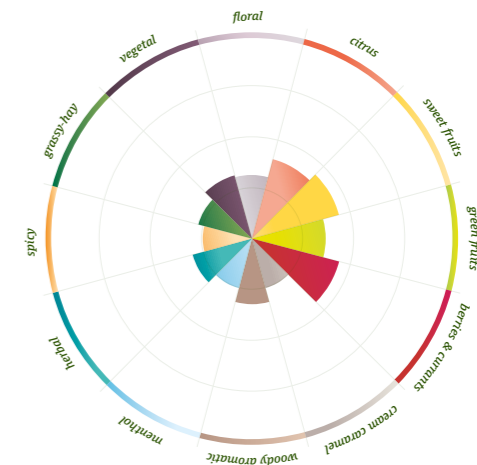
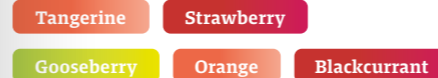
Fresh and fruity would be a good way to describe Mandarin Bavaria. Instead of tangerine and orange this year it is the berries that meet gooseberry for an enchanting dance.

i For your brewing: The characteristic citrus and sweet fruits characters of Mandarin Bavaria are considerably lower in 2022. You can substitute a portion with a different variety strong in these categories, like Eclipse®. Additionally, if you have enough hops from 2021, you can blend the two harvests.

TYPICAL AROMA PROFILE

Mandarina Bavaria's aroma is dominated by tangerine and orange with some black and red currant. It also has hints of rosemary and gooseberry notes.

Average Key Flavors since 2018



Perle

Harvest 2022



Key Flavors 2022



This hop variety has been around since the 1970s and continues to be successful. It was bred in Huell from Northern Brewer. Its popularity is due to its combination of good alpha acid content and pleasant aromawith a relatively high alpha content lead to its popularity amongst brewers.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Northern Brewer
Alpha Acids*	4.5 - 11.0 %
Total Polyphenols	no data
Total Oil	0.8 - 2.0 ml/100 g
Beta Acids	2.0 - 5.5 %

% OF TOTAL OIL

Myrcene	27.0 - 45.0 %	Geraniol	0.8 - 0.1 %
Linalool	0.3 - 0.2 %	Terpene esters & -alcohols	1.1 - 1.5 %
Humulene	28.0 - 34.0 %	Ketones	0.6 - 0.8 %
Caryophyllene	12.0 - 16.0 %	Isobutyrate	0.7 - 0.9 %
Farnesene	no data	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

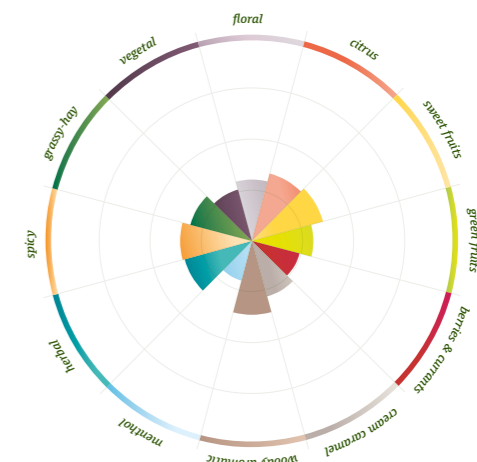
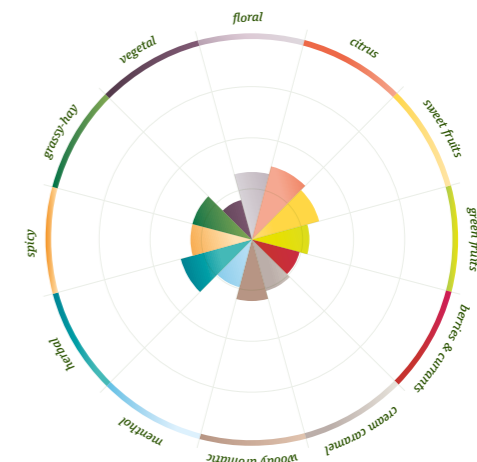
The "pearl" of the Hallertau brings us fine aromas despite the challenging harvest. Sweet dried fruits are balanced with pear aromas. Hints of lemon and pepper give a unique twist. Slight notes of marjoram ensure a measure of classic Hallertau aroma.

i For your brewing: The characteristic balanced aroma profile of Perle is comparable to the average profile - the herbal character is less pronounced than usual. There is no need to change anything in your brewing recipes when using Perle.

TYPICAL AROMA PROFILE

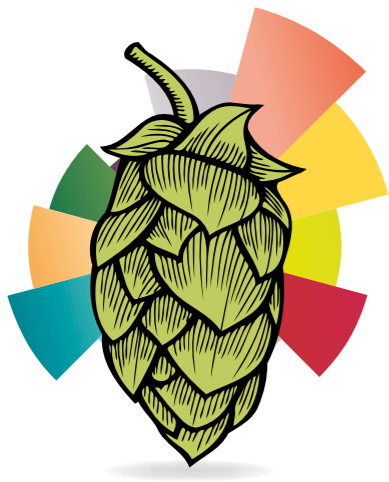
Perle offers a little bit of everything - green fruits, citrus and honey are balanced out by woody barrique and peppery notes.

Average Key Flavors since 2018



Spalter Select

Harvest 2022



Key Flavors 2022

Orange

Lime

Tangerine

Peach

Grapefruit

Spalter Select is, as its name suggests, a derivative of the traditional Spalter bred in Huell. It is characterized by a high farnesene content and a fine aroma. Spalter Select is particularly resistant to diseases.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Huell breeding line
Alpha Acids*	3.0 - 6.5 %
Total Polyphenols	4.5 - 6.5 %
Total Oil	0.5 - 1.3 ml/100 g
Beta Acids	2.0 - 6.0 %

% OF TOTAL OIL

Myrcene	55.0 - 62.0 %	Geraniol	0.6 - 0.8 %
Linalool	1.0 - 1.3 %	Terpene esters & -alcohols	0.1 - 0.3 %
Humulene	6.0 - 7.0 %	Ketones	1.0 - 1.2 %
Caryophyllene	2.0 - 3.0 %	Isobutyrate	0.7 - 0.9 %
Farnesene	8.0 - 9.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

Spalter Select in 2022 is surprisingly citrus. Herbal notes of thyme and lovage are complemented by some peach flavors.

i For your brewing: The characteristic balanced aroma profile of Spalter Select shows stronger citrus but also subdued sweet fruit profile for 2022. However, the differences are not substantial. There is no need to change anything in your brewing recipes when using Spalter Select.

TYPICAL AROMA PROFILE

Spalter Select offers a range of unusual aromas, combining thyme and apple blossoms with spicy-herbal wormwood and tart citrus fruits.

Average Key Flavors since 2018

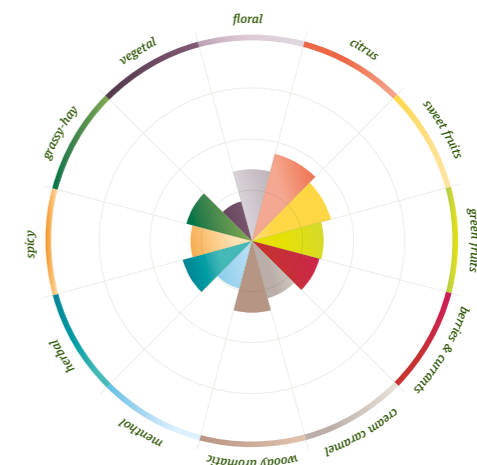
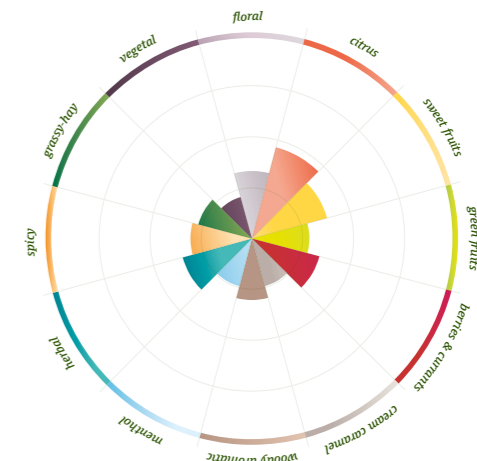
Thyme

Lemon

Cucumber

Lovage

Green Tea



Tango

Harvest 2022



Key Flavors 2022

Pineapple

Raspberry

Strawberry

Pine

Peach

Tango, originally known as 2011/02/04, was developed in Huell and has been grown in the Hallertau since 2020. Its heritage includes global well-known varieties like Cascade and Hallertauer Tradition, which is reflected in its aroma and agronomic traits.

ANALYSIS VALUES

Growing Area	Germany
Heritage	US Cascade x Huell breeding line (Descendant of Hallertauer Tradition)
Alpha Acids*	9.0 - 12.0 %
Total Polyphenols	no data
Total Oil	2.4 - 4.0 ml/100 g
Beta Acids	6.0 - 10.0 %

% OF TOTAL OIL

Myrcene	58.0 - 60.0 %	Geraniol	1.0 - 1.2 %
Linalool	0.3 - 0.5 %	Terpene esters & -alcohols	0.3 - 0.5 %
Humulene	0.0 - 10.0 %	Ketones	1.2 - 1.4 %
Caryophyllene	1.0 - 2.0 %	Isobutyrate	0.9 - 1.1 %
Farnesene	8.0 - 10.0 %	Thiols (µg/kg)	5.0 - 7.5

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

We would like to dance the fruity tango and let ourselves be carried off into the fantastic world of fresh fruit. The Tango music this year is a bit more quiet. Tango still shows fruity aromas of passion fruit and grapefruit, but some of the berries are hiding this year.

i For your brewing: The characteristic distinct aroma profile of Tango of strong sweet fruit, citrus and berry flavors is very subdued in 2022. To obtain a fruit intensive aroma, a contribution of other varieties like Mosaic®, Galaxy®, Enigma® or Citra® through a partial substitution could help.

TYPICAL AROMA PROFILE

Tango typically shows fruity aromas specifically of intense passion fruit and grapefruit, and is rounded off with a resinous note finishing with fine lemon and apple. If you would not know better you would think it is a new World hop. However sulfury notes can get in the way depending on harvest year and harvest time.

Average Key Flavors since 2021

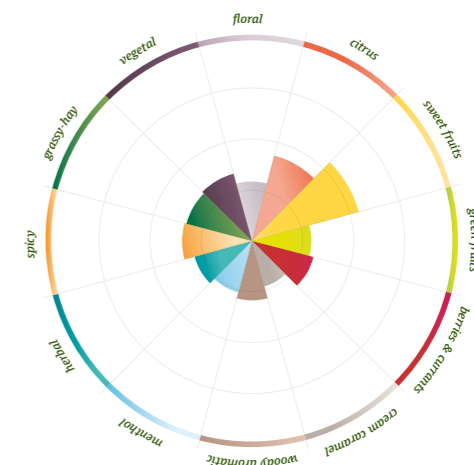
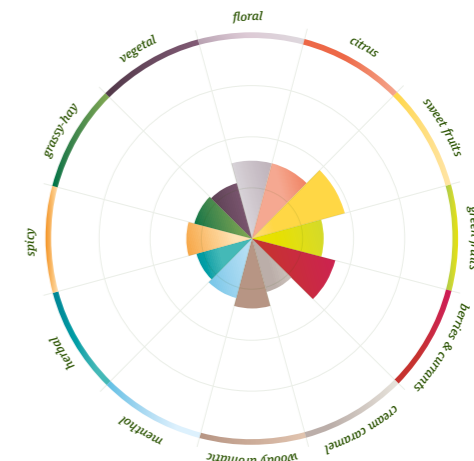
Lemon

Passion Fruit

Apple

Resin

Grapefruit



Tettnanger

Harvest 2022



Key Flavors 2022

Geranium

Lemongrass

Green Tea

Hay

Pepper

A traditional landrace variety from the Saaz group and is mainly cultivated around Tettnang on Lake Constance. The unique combination of the favorable climate by Lake Constance and sandy clay soils, created during the Ice Age, produces a very fine aroma. This variety has a good tolerance to plant diseases.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Landrace variety
Alpha Acids*	2.5 - 5.5 %
Total Polyphenols	no data
Total Oil	0.5 - 0.9 ml/100 g
Beta Acids	3.0 - 5.0 %

% OF TOTAL OIL

Myrcene	20.0 - 50.0 %	Geraniol	0.3 - 0.5 %
Linalool	0.4 - 0.9 %	Terpene esters & -alcohols	0.4 - 0.6 %
Humulene	no data	Ketones	1.4 - 1.6 %
Caryophyllene	3.0 - 5.0 %	Isobutyrate	no data
Farnesene	11.0 - 12.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

The soft summer breeze from Lake Constance carries the scent of fresh hay. Fresh cucumber and the tender aroma of lily of the valley complement the lovely hops. Cognac and bergamot bring an extraordinary character to this classic variety.

i For your brewing: The characteristic balanced aroma profile of Tettnanger is comparable to the average profile - the citrus character is less pronounced than usual. There is no need to change anything in your brewing recipes when using Tettnanger.

TYPICAL AROMA PROFILE

In the raw hops, woody aromas and cream caramel components, such as resin and almonds predominate, combined with fruity blueberry and spicy curry.

Average Key Flavors since 2018

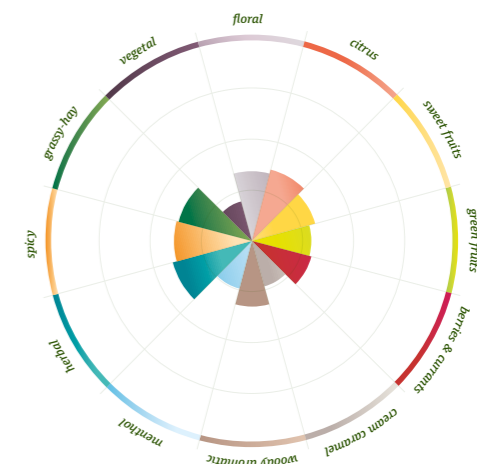
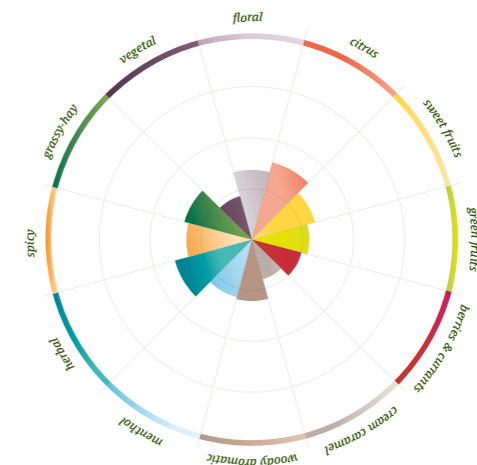
Cognac

Bergamot

Cucumber

Lily Of The Valley

Marjoram



Titan

Harvest 2022



Key Flavors 2022

- Fennel Seed
- Aniseed
- Geranium
- Curry
- Pepper

Titan is a newly released (2022) high alpha variety from the Hop Research Center in Huell. This variety was bred from the high alpha variety Polaris and provides the same harvest yield as Herkules, powdery provides the same harvest yield and paodery mildew resistance as Herkules. It can be can be grown more sustainably with lower plant protections.

ANALYSIS VALUES

Growing Area	Germany
Heritage	Polaris x Huell male
Alpha Acids*	14.0 - 20.0 %
Total Polyphenols	no data
Total Oil	2.5 ml/100 g
Beta Acids	4.0 - 5.5 %

% OF TOTAL OIL

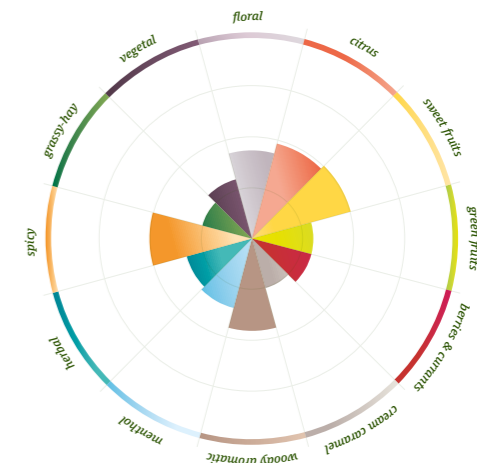
Myrcene	60.1 %	Geraniol	0.3 %
Linalool	0.5 %	Terpene esters & -alcohols	1.3 %
Humulene	18.1 %	Ketones	2.4 %
Caryophyllene	5.0 %	Isobutyrate	1.1 %
Farnesene	< 0.1 %	Thiols (µg/kg)	1.5

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

We don't have much experience with this hop variety yet, but the 2022 harvest of this alpha-acid strong variety shows the appeal of sweet fruits and next to curry and a scent of geraniums.

i For your brewing: Brewing experience with this variety is still limited. Of course, it is predestined for bitterness because of the high alpha content, but take a look at this variety from an aroma point of view.



Aurora

Harvest 2022



Key Flavors 2022



The name of this hop variety is derived from the Latin word for dawn. It was bred from Northern Brewer and possesses an intense and pleasant hoppy aroma and very good storage stability.

ANALYSIS VALUES

Growing Area	Slovenia
Heritage	Daughter of Northern Brewer
Alpha Acids*	7.0 - 12.0 %
Total Polyphenols	3.5 - 5.0 %
Total Oil	0.9 - 2.4 ml/100 g
Beta Acids	2.5 - 4.5 %

% OF TOTAL OIL

Myrcene	35.0 - 57.0 %	Geraniol	0.1 - 0.3 %
Linalool	0.5 - 0.8 %	Terpene esters & -alcohols	0.6 - 0.8 %
Humulene	12.0 - 14.0 %	Ketones	2.3 - 2.5 %
Caryophyllene	4.0 - 4.2 %	Isobutyrate	0.8 - 1.0 %
Farnesene	4.7 - 4.9 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

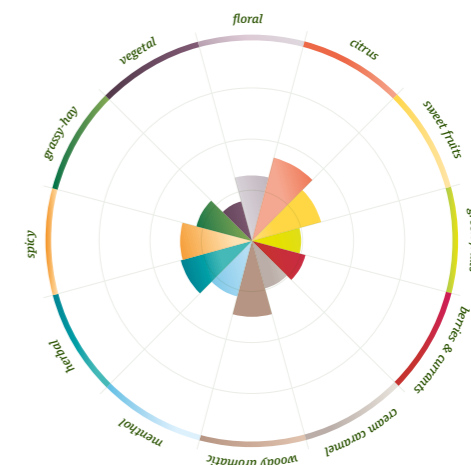
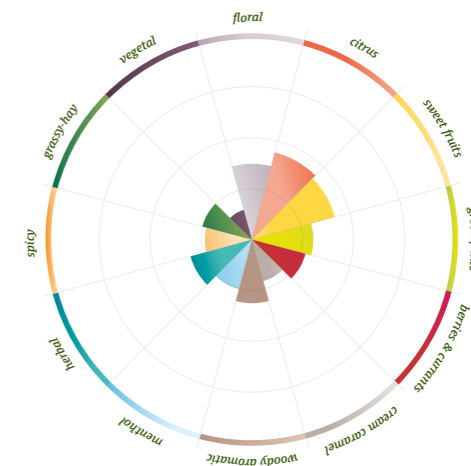
Aurora, the break of dawn, shows its gorgeous face in 2022 with pleasant aromas of fresh hay and flowers. These aromas are combined with resinous, pepper and menthol notes.

i For your brewing: The characteristic balanced aroma profile of Aurora is comparable to the average profile – the citrus character is even more pronounced than usual. There is no need to change anything in your brewing recipes when using Aurora.

TYPICAL AROMA PROFILE

Aurora combines intense floral and herbal aromas, such as apple blossom and lovage with citrusy notes of lime and passion fruit, as well as resinous and woody notes of pepper and juniper.

Average Key Flavors since 2018



Celeia

Harvest 2022



Key Flavors 2022



This cultivar is grown mainly in Slovenia, but also in Austria. Due to its characteristic aroma and its average alpha values, it is a very popular variety.

ANALYSIS VALUES

Growing Area	Slovenia
Heritage	Daughter of Styrian Savinjski Golding
Alpha Acids*	3.5 - 5.0 %
Total Polyphenols	no data
Total Oil	1.2 - 1.6 ml/100 g
Beta Acids	2.0 - 3.3 %

% OF TOTAL OIL

Myrcene	27.0 - 40.0 %	Geraniol	0.0 - 0.2 %
Linalool	0.6 - 1.2 %	Terpene esters & -alcohols	0.7 - 0.9 %
Humulene	34.0 - 38.0 %	Ketones	0.3 - 0.5 %
Caryophyllene	9.0 - 11.0 %	Isobutyrate	0.1 - 0.3 %
Farnesene	0.0 - 5.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

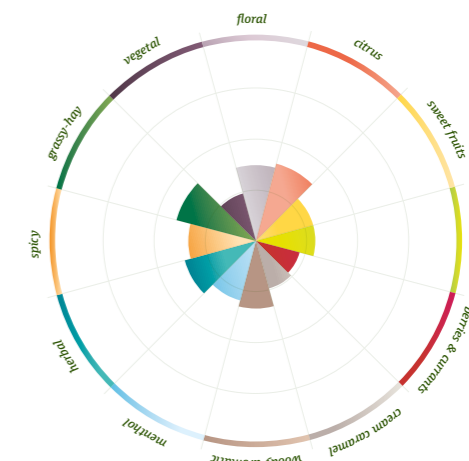
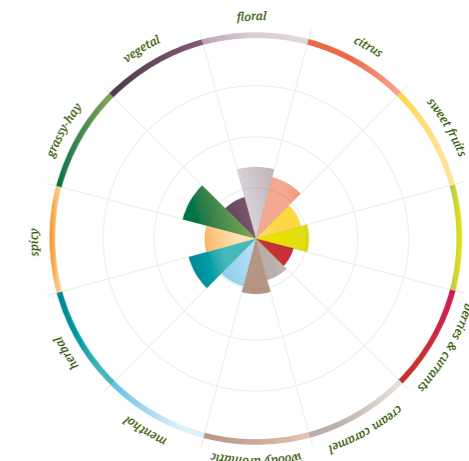
Celeia surrounds itself with a bouquet of Mediterranean herbs. Thyme and basil are complemented by fresh hay and incense. Fresh grapefruit aroma gives a citrusy twist to this variety.

i For your brewing: The characteristic balanced and floral aroma profile of Celeia is comparable to the average profile – the citrus character is less pronounced than usual. There is no need to change anything in your brewing recipes.

TYPICAL AROMA PROFILE

Celeia presents predominantly savory aromas such as thyme combined with fruity pear and fresh lime flavors. Incense and fresh hay add a special character.

Average Key Flavors since 2018



Saaz

Harvest 2022



Key Flavors 2022



Saaz is a Czech landrace that contributed significantly to the flavor profile of traditional Czech Pilseners. It is well-known for its mild, noble hop aroma.

ANALYSIS VALUES

Growing Area	Czech Republic
Heritage	Landrace variety
Alpha Acids*	3.4 - 5.6 %
Total Polyphenols	4.1 - 7.0 %
Total Oil	0.5 - 0.6 ml/100 g
Beta Acids	4.0 - 4.0 %

% OF TOTAL OIL

Myrcene	35.0 - 40.0 %	Geraniol	0.3 - 0.5 %
Linalool	0.3 - 0.5 %	Terpene esters & -alcohols	0.5 - 0.7 %
Humulene	0.0 - 20.0 %	Ketones	2.2 - 2.4 %
Caryophyllene	4.0 - 5.0 %	Isobutyrate	no data
Farnesene	13.0 - 14.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

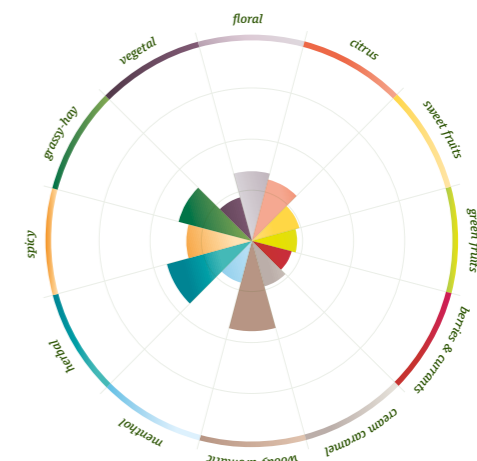
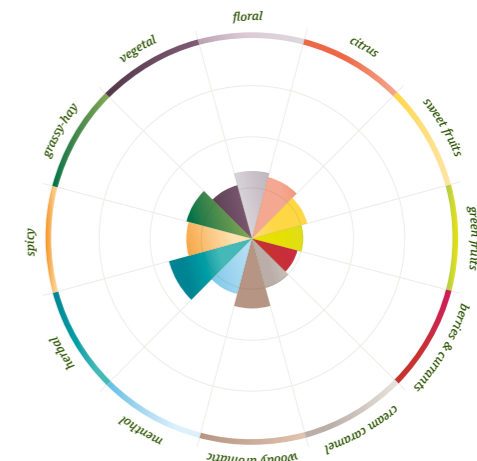
Saaz hops can surely be described as a long-serving variety. In spite of this, the reliable variety remains true to its typical profile: spicy - woody - herbal. Aromas of hay, thyme and cedar are lightened up by floral notes of chamomile and geranium.

i For your brewing: The characteristic balanced aroma profile of Saaz holds true, but overall to a noticeable lower intensity compared to the average profile - the floral character is less pronounced than usual. You can work with the LUPOMAX® pellets of this variety for higher intensities. The combination with other classic aroma varieties can also help to increase the intensity levels in the beer.

TYPICAL AROMA PROFILE

Spicy, woody, herbal - an unmistakable hop variety. It smells of tobacco, thyme, pine and hay. Saaz even shows its soft side with hints of geranium.

Average Key Flavors since 2018



Cascade

Harvest 2022



Key Flavors 2022

Grapefruit

Honeydew Melon

Lime

Geranium

Orange

Cascade was developed in the U.S.D.A. breeding program in Oregon and released as a U.S. aroma variety in 1972. It is named after the Cascade mountain range in the Pacific Northwest and has a distinct fruity, citrusy aroma. For a long time it was the most popular hop variety for craft brewing before being overtaken by Citra® (HBC 394 c.v.).

ANALYSIS VALUES

Growing Area	United States
Heritage	cross of English Fuggle with a male descendant of the Russian variety Serebrianka
Alpha Acids*	4.5 - 7.0 %
Total Polyphenols	no data
Total Oil	1.3 - 1.3 ml/100 g
Beta Acids	4.8 - 7.0 %

% OF TOTAL OIL

Myrcene	45.0 - 60.0 %	Geraniol	0.2 - 0.4 %
Linalool	0.3 - 0.6 %	Terpene esters & -alcohols	1.0 %
Humulene	8.0 - 13.0 %	Ketones	1.2 %
Caryophyllene	3.0 - 6.0 %	Isobutyrate	0.3 %
Farnesene	3.0 - 7.0 %	Thiols (µg/kg)	3.3

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

Cascade shows intense notes of citrus and sweet fruits in 2022. Blackcurrant enters into a balanced aroma to play in the background.

i For your brewing: The berry character of Cascade is considerably lower in the 2022 harvest. Apart from that, the intensity is comparable to the usual aroma profile of Cascade. Since the berry aroma is specifically suffering in this year's harvest, the partial use of 2021 varieties strong in berries like Chinook, Citra® and Talus™ can help boost the aroma.

TYPICAL AROMA PROFILE

Cascade offers refreshing lime aromas, green fruits like grapes and quince, and sweet fruits like plum and peach. It is rounded off with aromas of raspberry sauce.

Average Key Flavors since 2018

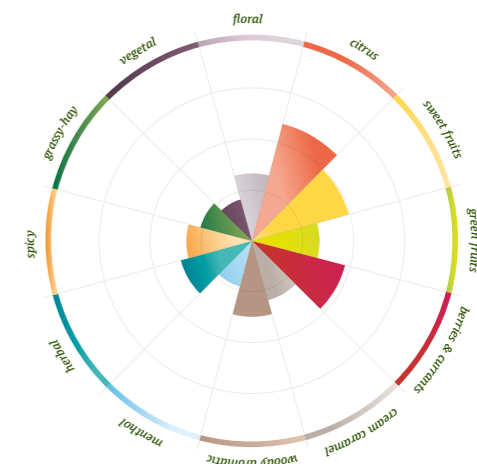
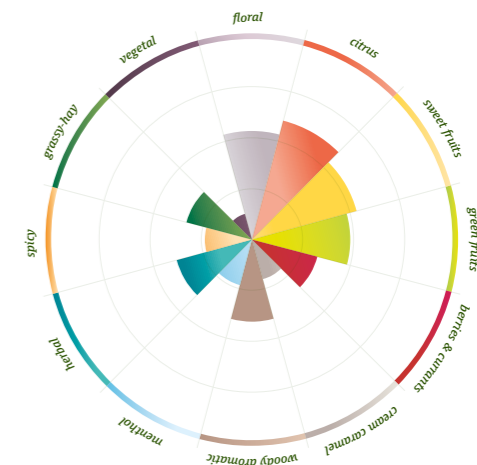
Blackberry

Plum

Caramel

Lime

Blackcurrant



Centennial

Harvest 2022



Key Flavors 2022



Centennial is an aroma cultivar bred in 1974 and released in 1990. Its ancestry is 75% Brewers Gold, with small contributions from Fuggles and East Kent Golding. It was named after the Washington State centennial in 1989. It is sometimes called Super-Cascade.

ANALYSIS VALUES

Growing Area	United States
Heritage	¾ Brewers Gold. ¾ ₃₂ Fuggle. ¼ ₁₆ East Kent Golding. ½ ₃₂ Bavarian and ¼ ₁₆ unknown
Alpha Acids*	9.5 - 11.5 %
Total Polyphenols	no data
Total Oil	1.5 - 2.5 ml/100 g
Beta Acids	3.4 - 4.5 %

% OF TOTAL OIL

Myrcene	45.0 - 55.0 %	Geraniol	1.2 - 1.8 %
Linalool	0.6 - 0.9 %	Terpene esters & -alcohols	3.2 %
Humulene	10.0 - 18.0 %	Ketones	0.5 %
Caryophyllene	5.0 - 8.0 %	Isobutyrate	0.8 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

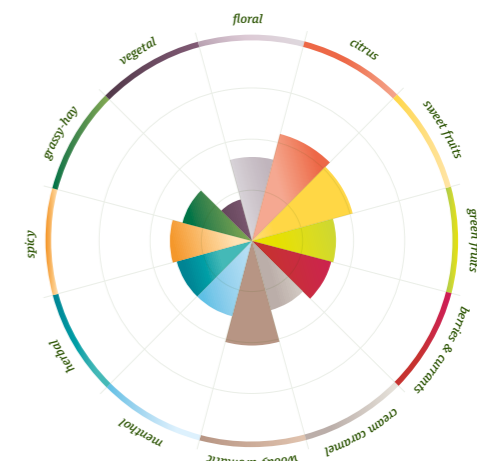
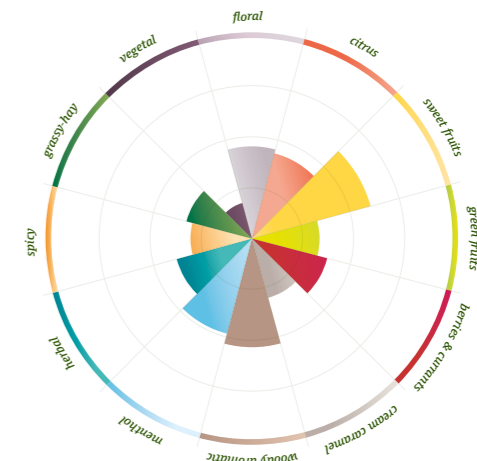
In 2022 Centennial is best described as citrus-resinous. Fresh ginger and pine needles dominate the aroma. This is softened by blueberry, orange and woodruff, thereby giving the variety a balanced overall character.

i For your brewing: The sweet fruit character of Centennial is slightly lower in 2022. Apart from that, the intensity is comparable to the usual aroma profile of Centennial. To compensate for the lack of sweet fruit flavor, a small portion of an intensely fruity variety such as Mosaic® or similar can be used.

TYPICAL AROMA PROFILE

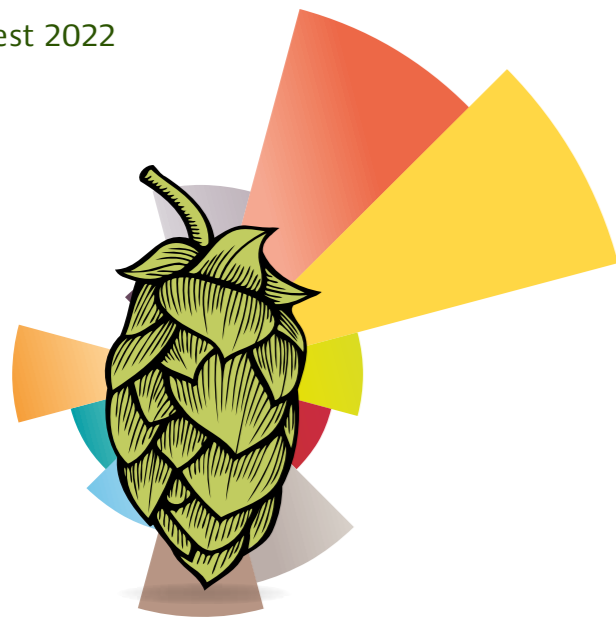
Centennial's aroma is composed of woody and spicy aromas like pine and barrique, combined with exotic lychee and pineapple. Fruity raspberry, fresh lemon and bergamot spiced with aniseed give a flavor explosion.

Average Key Flavors since 2018



Chinook

Harvest 2022



Key Flavors 2022



Chinook was developed by the U.S.D.A. breeding program in Washington State and released in 1985 as a high alpha acid variety. This cultivar takes its name from a Native American tribe indigenous to the region around Washington. The female parent is one of the English Goldings.

ANALYSIS VALUES

Growing Area	United States
Heritage	Heritage of Petham Golding
Alpha Acids*	11.5 - 15.0 %
Total Polyphenols	no data
Total Oil	1.0 - 2.5 ml/100 g
Beta Acids	no data

% OF TOTAL OIL

Myrcene	20.0 - 30.0 %	Geraniol	0.7 - 1.0 %
Linalool	0.3 - 0.5 %	Terpene esters & -alcohols	no data
Humulene	18.0 - 24.0 %	Ketones	no data
Caryophyllene	9.0 - 11.0 %	Isobutyrate	no data
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

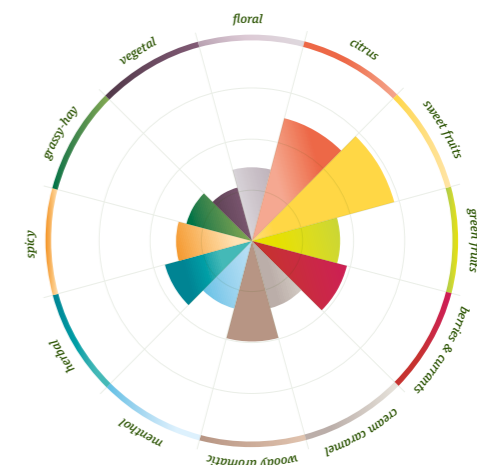
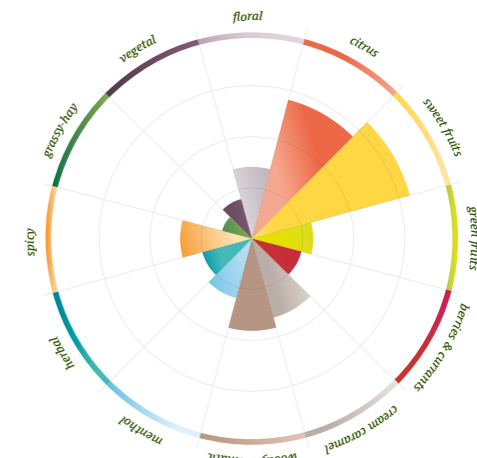
The typical resinous and citrus notes (lemon and orange) of Chinook is complemented in 2022 by exotic pineapple and passion fruit, which increases the complexity.

i For your brewing: For 2022, Chinook was especially fruit-forward. Potent aromas of Pineapple, Mixed Stone Fruits, and Tropical Fruits like Guava were present. This is not to say that the traditional aromas of Grapefruit, Pine Resin, and Fennel were not present or will not present in your recipes. This might be a good year to try Chinook (as LUPOMAX® or INCOGNITO!) in a hazy IPA along with other fruit-forward hops like Citra® and Azacca.

TYPICAL AROMA PROFILE

In its raw state, this hop has a herbal, which is reminiscent of tarragon, juniper, basil and lavender. It is held together with well-balanced citrus and sweet fruit notes, including grapefruit, orange, kiwi and passion fruit.

Average Key Flavors since 2018



Citra® HBC 394 c.v.

Harvest 2022



Key Flavors 2022



Citra® (HBC 394 c.v.) was released in 2008 and is now the biggest US hop variety in terms of growing area. It was bred by John I. Haas in the 1990s and ultimately integrated into the Hop Breeding Company (HBC). The parents are from Hallertau Mittelfrueh and a male descendant of Tettnanger.

ANALYSIS VALUES

Growing Area	United States
Heritage	50.0 % Hallertau. 25.0 % US Tettnang. 25.0 % unknown
Alpha Acids*	11.0 - 13.0 %
Total Polyphenols	no data
Total Oil	2.2 - 2.8 ml/100 g
Beta Acids	3.0 - 4.5 %

% OF TOTAL OIL

Myrcene	60.0 - 70.0 %	Geraniol	0.3 - 0.5 %
Linalool	0.6 - 0.9 %	Terpene esters & -alcohols	1.9 - 2.2 %
Humulene	7.0 - 12.0 %	Ketones	0.9 - 1.2 %
Caryophyllene	5.0 - 8.0 %	Isobutyrate	0.4 - 0.6 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	26.0 - 30.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

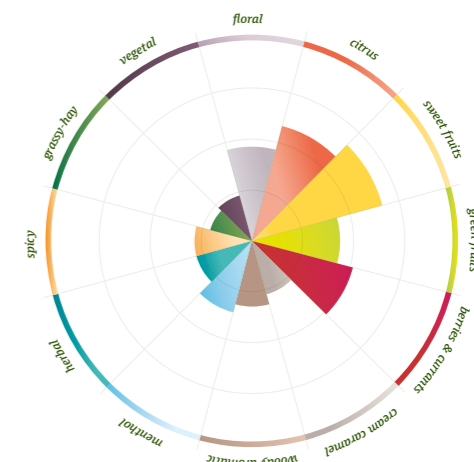
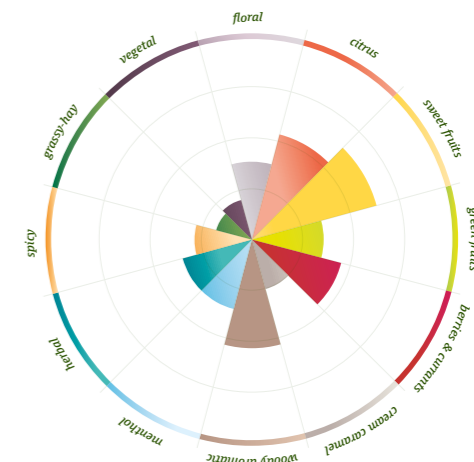
Citra® shows its characteristic profile in 2022. In all of its aroma splendor, Citra® shines with passion fruit, lemongrass and raspberries. Woody aromas play a stronger part than usual.

i For your brewing: The characteristic fruity aroma profile of Citra® is comparable to the average profile – however with a lower overall intensity. Woody and herbal characters are slightly stronger in 2022. There is no need to change anything in your brewing recipes when using Citra®. You can substitute a portion with LUPOMAX® pellets, SPECTRUM of this variety or slightly increase your dosage.

TYPICAL AROMA PROFILE

The name says it all – this variety is all about the citrus fruits. However, it also offers red currants, gooseberries, lychee, pineapple and a hint of lilac.

Average Key Flavors since 2018



Columbus

Harvest 2022



Key Flavors 2022



Columbus, along with Tomahawk and Zeus, is one of the most important US high alpha varieties. All three are daughters of Nugget and they are thus half-sisters.

ANALYSIS VALUES

Growing Area	United States
Heritage	Daughter of Nugget
Alpha Acids*	14.5 - 17.5 %
Total Polyphenols	no data
Total Oil	2.5 - 4.5 ml/100 g
Beta Acids	4.5 - 6.0 %

% OF TOTAL OIL

Myrcene	45.0 - 55.0 %	Geraniol	0.2 - 0.5 %
Linalool	0.4 - 0.6 %	Terpene esters & -alcohols	0.8 %
Humulene	9.0 - 14.0 %	Ketones	0.8 %
Caryophyllene	6.0 - 10.0 %	Isobutyrate	0.4 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	4.2

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

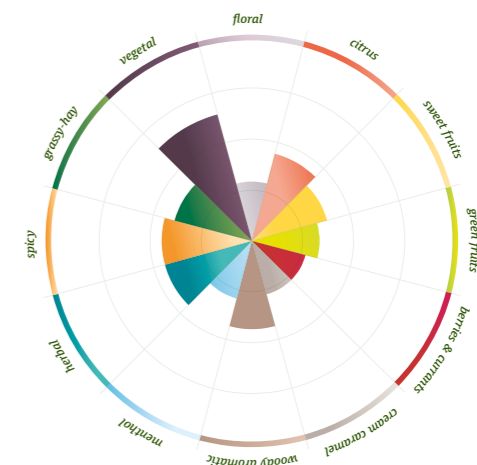
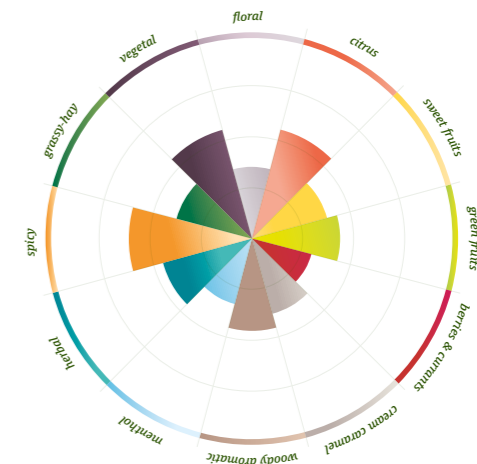
Columbus stays true to its vegetal character. A lot of onion and leek determine its aroma. After smelling for a second time, you will be surprised with dried fruit, fennel and notes of an oak barrel.

i For your brewing: The characteristic aroma profile of Columbus is comparable to the average profile with lower vegetal flavors. There is no need to change anything in your brewing recipes when using Columbus.

TYPICAL AROMA PROFILE

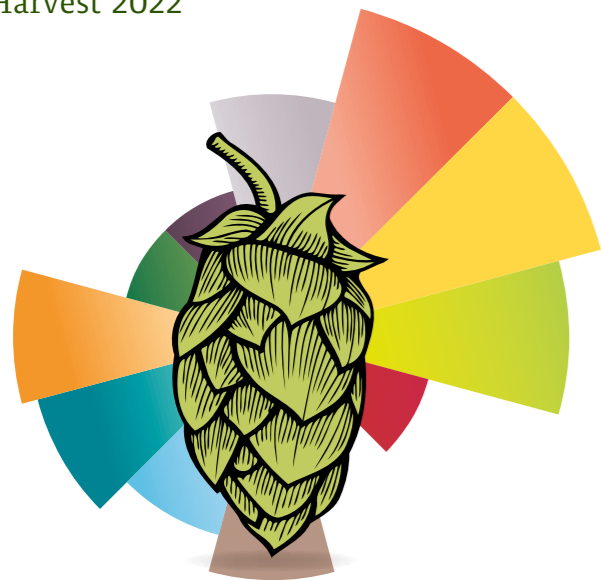
Columbus is well-known for its vegetal notes, but it also offers sweet fruit, floral, citrusy and herbal aromas.

Average Key Flavors since 2018



Ekuanot® HBC 366 c.v.

Harvest 2022



Key Flavors 2022



As the variety Hallertau Mittelfruh was endangered due to its susceptibility to wilt, a successor was sought. Hallertauer Tradition was successful in agronomic and brewing trials and released in 1992. Its broad pest resistance and reliable yields make it very popular despite the fact that its aroma profile is not entirely comparable to Hallertau Mittelfruh.

ANALYSIS VALUES

Growing Area	United States
Heritage	Ekuanot® HBC 366 c.v. = YCR 5 (Warrior) x YCR 136
Alpha Acids*	14.5 - 15.5 %
Total Polyphenols	no data
Total Oil	2.5 - 4.5 ml/100 g
Beta Acids	4.5 - 5.5 %

% OF TOTAL OIL

Myrcene	30.0 - 45.0 %	Geraniol	no data
Linalool	no data	Terpene esters & -alcohols	no data
Humulene	12.0 - 20.0 %	Ketones	no data
Caryophyllene	8.0 - 12.0 %	Isobutyrate	no data
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

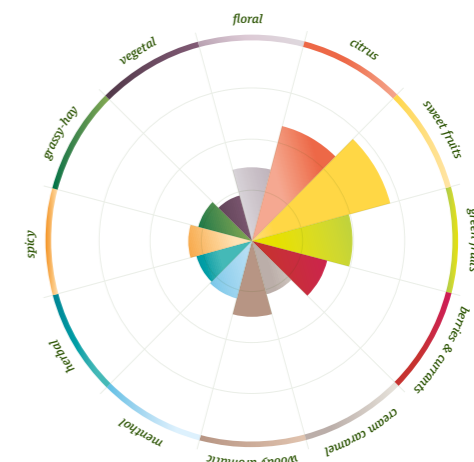
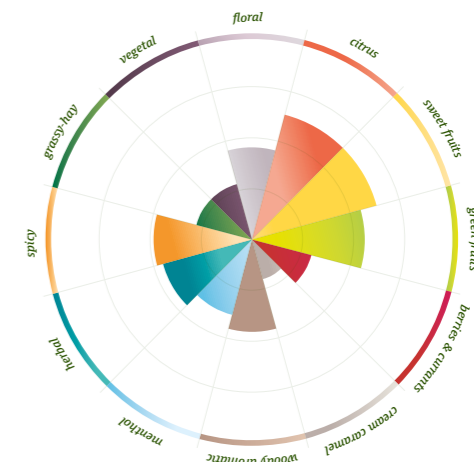
The fruit bomb Ekuanot® lives up to expectations in 2022 and shows guava, passion fruit, grapefruit and blackcurrant in a great flavor combination. Ginger complements the exotic mixture with its freshness.

i For your brewing: The characteristic fruity aroma profile of Ekuanot® is comparable to the average profile – however with a slightly lower overall intensity. There is no need to change anything in your brewing recipes when using Ekuanot®. You can substitute a portion with LUPOMAX® pellets of this variety or slightly increase your dosage.

TYPICAL AROMA PROFILE

These hops are fruity to the core and reminiscent of an exotic cocktail. Grapefruit, lemongrass and mandarin lend tangy accents to ripe guava, lychee, mango, pineapple and passion fruit. Blackcurrants, gooseberries and grapes round off the flavor profile.

Average Key Flavors since 2018



Mosaic® HBC 369 c.v.

Harvest 2022



Key Flavors 2022



Mosaic® (HBC 369 c.v.) was bred by the Hop Breeding Company (HBC) and released in 2012. Its parents are Simcoe® and a male descendant of Nugget. Like Citra® (HBC 394 c.v.), Mosaic® is widely popular in the craft brewing industry.

ANALYSIS VALUES

Growing Area	United States
Heritage	Simcoe® x male Nugget
Alpha Acids*	10.5 - 14.0 %
Total Polyphenols	no data
Total Oil	0.8 - 3.0 ml/100 g
Beta Acids	3.2 - 4.0 %

% OF TOTAL OIL

Myrcene	50.0 - 60.0 %	Geraniol	0.3 - 0.7 %
Linalool	0.2 - 0.6 %	Terpene esters & -alcohols	2.0 - 2.5 %
Humulene	12.0 - 14.0 %	Ketones	3.0 - 4.0 %
Caryophyllene	3.0 - 8.0 %	Isobutyrate	1.0 - 2.0 %
Farnesene	0.0 - 0.1 %	Thiols (µg/kg)	22.0 - 27.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

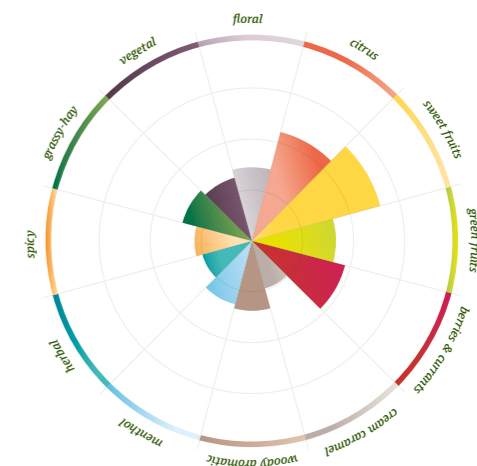
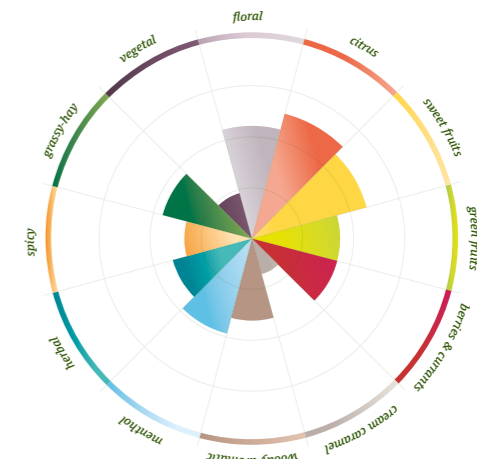
The aromas of the thiols split the response of tasters. And that is exactly what happened for Mosaic® in 2022. For some, Mosaic® is a typical fruit salad with passion fruit, blackcurrant and grapefruit. For others, the aromas of fresh onions resonate.

i For your brewing: The characteristic fruity aroma profile of Mosaic® is comparable to the average profile, however with a slightly lower overall intensity. There is no need to change anything in your brewing recipes when using Mosaic®. You can substitute a portion with LUPOMAX® pellets or SPECTRUM of this variety or slightly increase your dosage.

TYPICAL AROMA PROFILE

Mosaic® offers a complex fruity aroma (pineapple, mango, passion fruit) combined with a freshness from lime and tangerine. Cassis as well as onions give the hop a special note.

Average Key Flavors since 2018



Sabro® HBC 438 c.v.

Harvest 2022



Key Flavors 2022



Sabro® (HBC 438 c.v.) was released in 2018 by the Hop Breeding Company (HBC). It is the result of a unique cross-pollination of YCR 123 with a female Neomexicanus hop.

ANALYSIS VALUES

Growing Area	United States
Heritage	cross pollination of a female neomexicanus hop and YCR 123
Alpha Acids*	13.0 - 17.0 %
Total Polyphenols	no data
Total Oil	1.8 - 3.4 ml/100 g
Beta Acids	4.0 - 6.5 %

% OF TOTAL OIL

Myrcene	65.0 - 68.0 %	Geraniol	0.8 - 1.6 %
Linalool	0.5 - 0.6 %	Terpene esters & -alcohols	no data
Humulene	7.0 - 14.0 %	Ketones	no data
Caryophyllene	7.0 - 17.2 %	Isobutyrate	no data
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

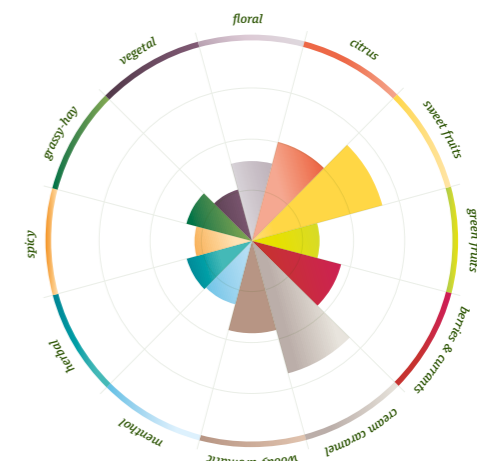
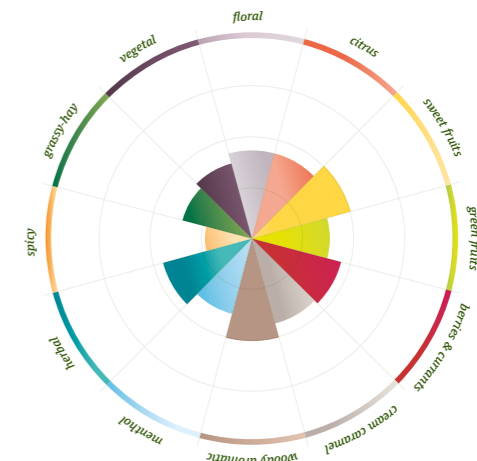
Sabro® normally contributes strong and complex fruit flavors to beer with notes of tangerine, pineapple and peach. These are rounded off by hints of cedar, dill and mint. The remarkable creaminess, with strong coconut and vanilla aromas is lower for the harvest 2022.

i For your brewing: The intense typical aromas of sweet fruit and cream caramel are noticeably less pronounced in the 2022 harvest. Since the sweet fruit and cream caramel aroma is specifically suffering in 2022, the partial use of 2021 Sabro® or a variety strong in cream caramel can help.

TYPICAL AROMA PROFILE

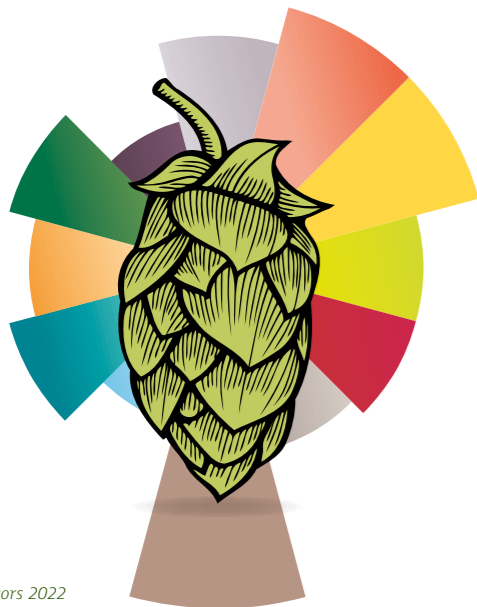
In 2021, Sabro®'s fruit flavors are tangerine, pineapple and peach. It retains its remarkable creaminess, with strong coconut and vanilla aromas. These are rounded off by hints of cedar, dill and mint.

Average Key Flavors since 2018



Talus™ HBC 692 c.v.

Harvest 2022



Key Flavors 2022



Talus™ (HBC 692 c.v.) is the daughter of Sabro® and open pollination. This makes Talus™ a niece of a Neomexicanus hop variety. Unlike the majority of hops grown in the Pacific Northwest, these hops are native to America and not derivatives of European varieties or anything from the southern hemisphere.

ANALYSIS VALUES

Growing Area	United States
Heritage	Daughter of Sabro® HBC 438 c.v. and open pollination
Alpha Acids*	8.1 - 9.5 %
Total Polyphenols	no data
Total Oil	2.0 - 2.7 ml/100 g
Beta Acids	8.3 - 10.2 %

% OF TOTAL OIL

Myrcene	40.0 - 50.0 %	Geraniol	1.0 - 3.0 %
Linalool	0.0 - 1.0 %	Terpene esters & -alcohols	no data
Humulene	16.0 - 21.0 %	Ketones	1.5 %
Caryophyllene	9.0 - 13.0 %	Isobutyrate	3.2 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	6.4

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

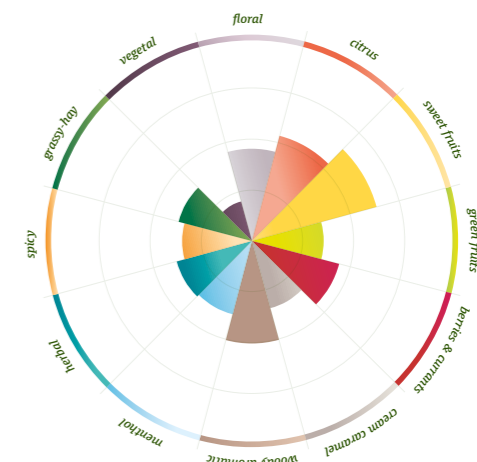
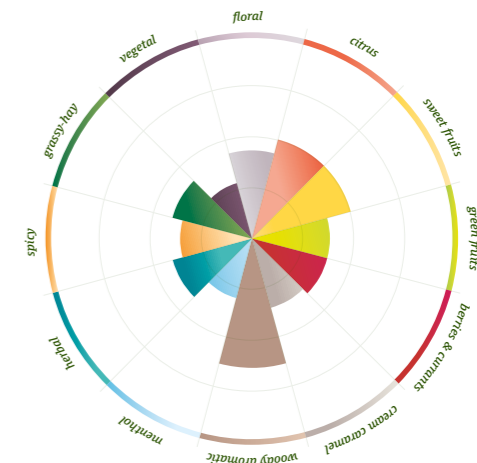
Pink grapefruit and tropical aromas are the main aroma character next to a strong woody bouquet for Talus™ in 2022. These aromas are supplemented with the freshness of lime and red currants, which make it a tantalizing mixture.

i For your brewing: The characteristic fruity aroma profile of Talus™ is comparable to the average profile, – however with a slightly lower overall intensity. Woody characters are stronger in 2022. There is no need to change anything in your brewing recipes when using Talus™. You might consider increasing the dosage slightly.

TYPICAL AROMA PROFILE

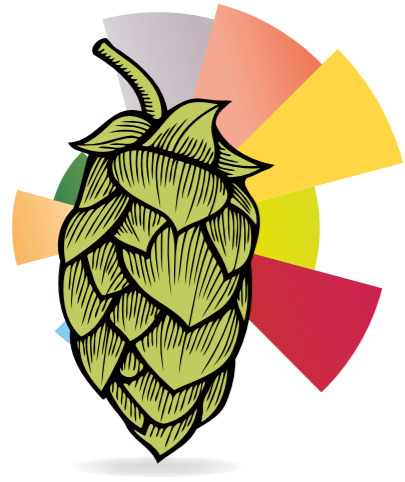
Pink grapefruit, peach and Mango are typical aroma characteristics of this variety. These aromas are normally supplemented with the freshness of lime and red currants, which make it a tantalizing mixture.

Average Key Flavors since 2021

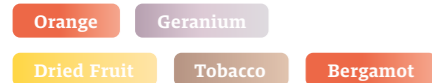


Eclipse®

Harvest 2022



Key Flavors 2022



Eclipse® is the newest proprietary hop from the HPA breeding program. It was created in 2004 and commercialised in 2020. The cross pollination of high alpha Australian and North American hops is bursting with sweet mandarin, zesty citrus peel and fresh pine needles.

ANALYSIS VALUES

Growing Area	Australia
Heritage	High Alpha Australian and North American
Alpha Acids*	15.7 - 18.7 %
Total Polyphenols	no data
Total Oil	1.7 - 1.9 ml/100 g
Beta Acids	5.9 - 9.0 %

% OF TOTAL OIL

Myrcene	35.0 - 45.0 %	Geraniol	0.3 %
Linalool	0.7 %	Terpene esters & -alcohols	0.7 %
Humulene	1.2 %	Ketones	5.8 %
Caryophyllene	5.0 - 15.0 %	Isobutyrate	3.8 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	35.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

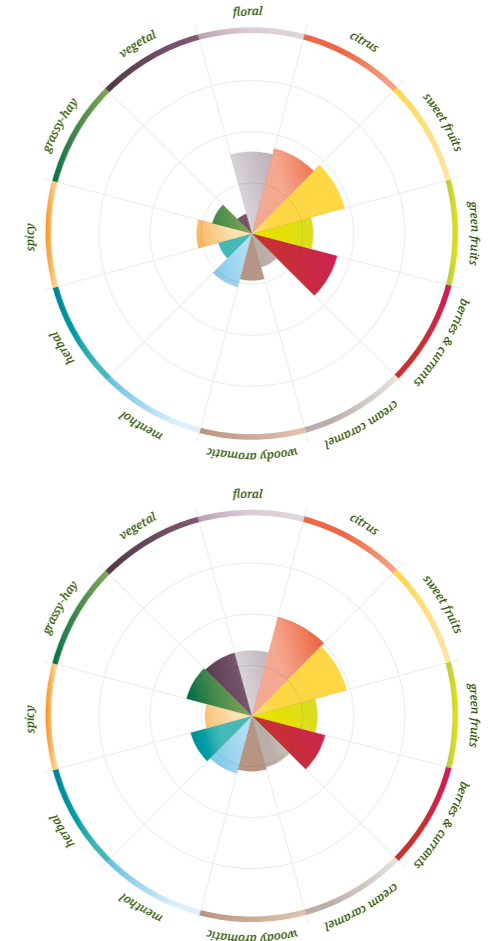
This hop variety shows strong floral and berry notes this year. Sweet and sour fruits like tangerine and grapefruit are given even more radiance with basil and pine in the background.

i For your brewing: The characteristic fruity aroma profile of Eclipse® is comparable to the average profile. There is no need to change anything in your brewing recipes when using Eclipse®.

TYPICAL AROMA PROFILE

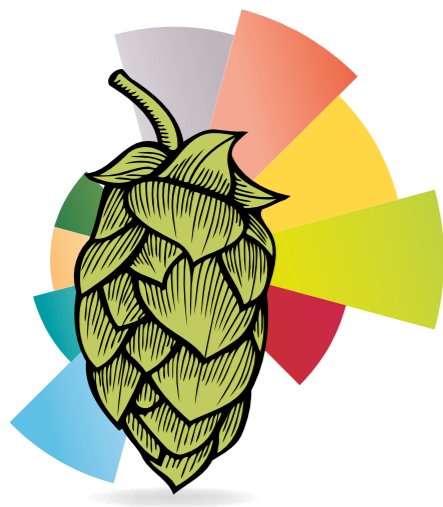
This young variety finds its identity in sweet and citrus fruits like kiwi, grapefruit and tangerine. However, it always has several other aromas to offer, such as fresh herbs and pleasant woody notes.

Average Key Flavors since 2021



Ella™

Harvest 2022



Key Flavors 2022



Ella™ is an aroma variety created by the HPA breeding program in 2001 and commercialised in 2011. The cross pollination of high alpha Australian breeding lines and Spalt hops contributes floral and spice notes that are reminiscent of, yet distinctly different in character to, noble European varieties, and provides a contrast to the citrus and tropical fruit characters of many modern hops.

ANALYSIS VALUES

Growing Area	Australia
Heritage	Female High Alpha Australian breeding line and a male derived from Spalt
Alpha Acids*	13.4 - 19.2 %
Total Polyphenols	no data
Total Oil	1.2 - 2.3 ml/100 g
Beta Acids	5.2 - 7.5 %

% OF TOTAL OIL

Myrcene	34.0 - 40.0 %	Geraniol	0.0 - 0.5 %
Linalool	0.4 - 0.6 %	Terpene esters & -alcohols	1.0 - 1.5 %
Humulene	16.3 - 22.7 %	Ketones	1.0 - 2.0 %
Caryophyllene	5.9 - 14.1 %	Isobutyrate	2.0 - 3.0 %
Farnesene	0.1 - 0.5 %	Thiols (µg/kg)	31.0 - 35.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

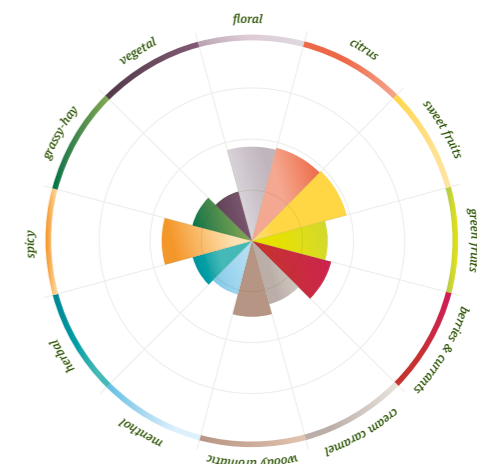
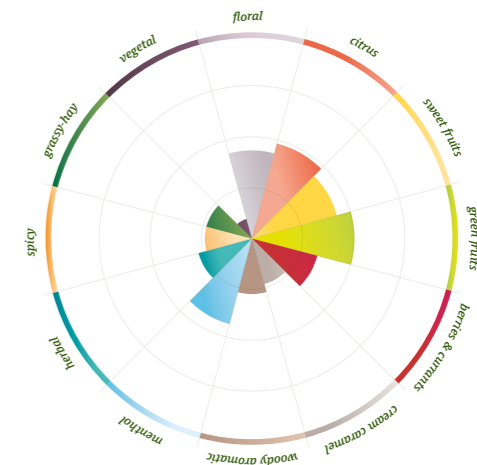
Ella™ shows stronger menthol notes in 2022 yet retains fresh notes of passion fruit, lime and bergamot. Still her typical character shines through, enticing with lavender and resinous pine.

i For your brewing: The characteristic fruity aroma profile of Ella™ is comparable to the average profile - the floral and sweet fruit has a slightly lower intensity. There is no need to change anything in your brewing recipes when using Ella™ - you might consider increasing the dosage slightly.

TYPICAL AROMA PROFILE

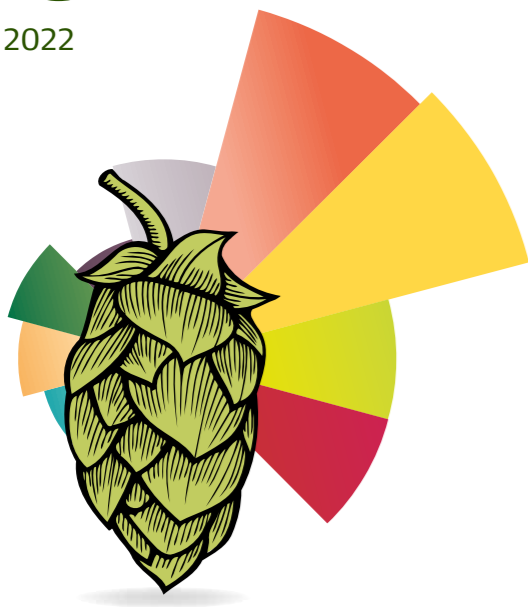
The distinctly floral aromas of this variety are unrivalled. They range from woody lavender and sage to sweet melon and peach. Distinct undertones of grapefruit and lime complete the picture.

Average Key Flavors since 2018



Enigma®

Harvest 2022



Key Flavors 2022



Enigma® is an aroma variety created by the HPA breeding program in 2002 and commercialised in 2015. The cross pollination of a genotype labelled as Swiss Tettang and north american germplasm offer a crispness and complexity where different aspects shine depending on dose rate and addition point.

ANALYSIS VALUES

Growing Area	Australia
Heritage	Swiss Tettang and North American
Alpha Acids*	13.5 - 16.5 %
Total Polyphenols	no data
Total Oil	2.4 - 3.0 ml/100 g
Beta Acids	4.8 - 7.1 %

% OF TOTAL OIL

Myrcene	20.0 - 35.0 %	Geraniol	0.0 - 0.3 %
Linalool	0.1 - 0.5 %	Terpene esters & -alcohols	0.8 - 1.2 %
Humulene	12.4 - 19.0 %	Ketones	1.3 - 1.8 %
Caryophyllene	6.3 - 8.0 %	Isobutyrate	2.0 - 3.0 %
Farnesene	9.2 - 11.4 %	Thiols (µg/kg)	2.0 - 6.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

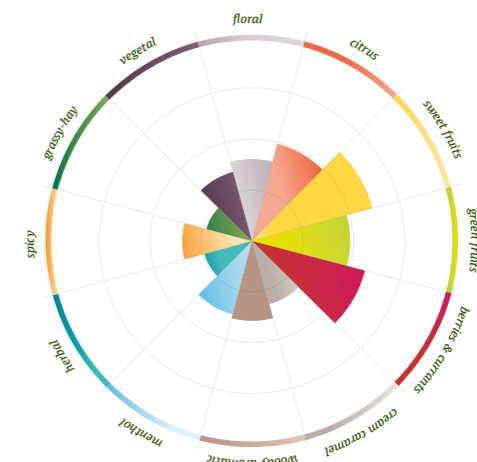
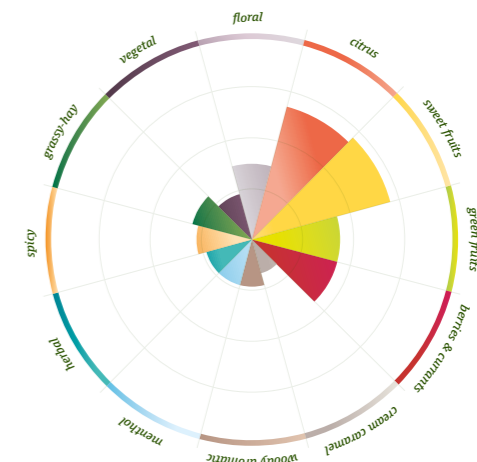
In 2022 we see more citrus but subdued berry notes, enriched by exotic passion fruit and pear, with a fresh breeze offered by a touch of camphor.

i For your brewing: The characteristic fruity aroma profile of Enigma® is comparable to the average profile – the floral and green fruit part has a slightly lower intensity. There is no need to change anything in your brewing recipes when using Enigma® – you might consider increasing the dosage slightly.

TYPICAL AROMA PROFILE

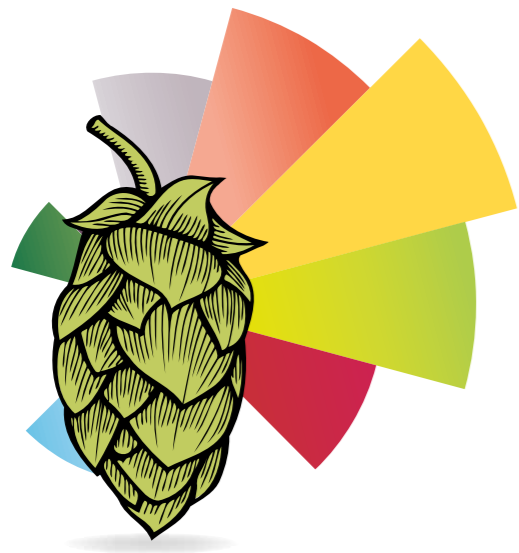
These hops are just as intense as a good glass of white wine: full-bodied, elegant and fruity. Temptingly cloaked in tart berries such as red currant, blackberry and gooseberry, with an exotic hint of melon.

Average Key Flavors since 2018

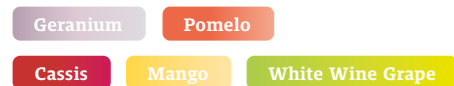


Galaxy®

Harvest 2022



Key Flavors 2022



Galaxy® is a world-renowned aroma variety created by the HPA breeding program in 1994 and commercialised in 2009. The cross pollination of an Australian female high alpha acid breeding line Australian and a male derived from Perle, grows vigorously and accumulates a high concentration of essential oils and alpha acids.

ANALYSIS VALUES

Growing Area	Australia
Heritage	High Alpha Australian and Perle
Alpha Acids*	11.0 - 18.5 %
Total Polyphenols	no data
Total Oil	1.9 - 2.9 ml/100 g
Beta Acids	5.0 - 11.0 %

% OF TOTAL OIL

Myrcene	32.0 - 56.0 %	Geraniol	0.1 - 0.3 %
Linalool	0.5 - 1.0 %	Terpene esters & -alcohols	1.0 - 2.0 %
Humulene	0.8 - 2.2 %	Ketones	4.0 - 6.0 %
Caryophyllene	7.0 - 14.7 %	Isobutyrate	3.0 - 4.0 %
Farnesene	2.8 - 5.1 %	Thiols (µg/kg)	8.0 - 12.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

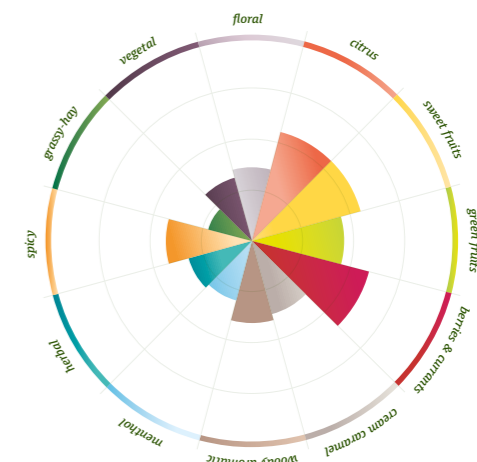
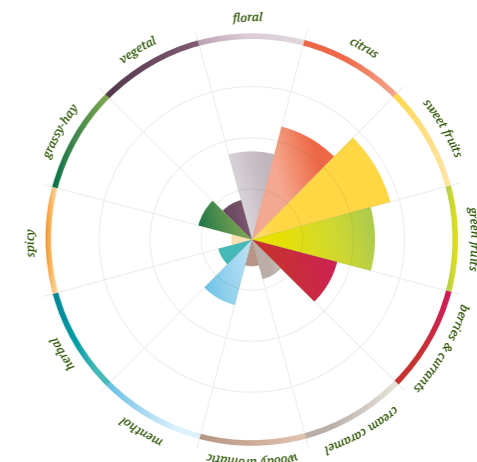
In 2022 Galaxy® delivers stronger sweet fruit notes but slightly hides the berries. The blackcurrant present flavors however, are surprisingly refreshing and balanced with grapefruit and celery. This intense flavor experience is completed with sweet notes of pineapple and gooseberry.

i For your brewing: The characteristic fruity aroma profile of Galaxy® is comparable to the average profile. There is no need to change anything in your brewing recipes when using Galaxy®. You can substitute a portion with SPECTRUM of this variety or slightly increase your dosage.

TYPICAL AROMA PROFILE

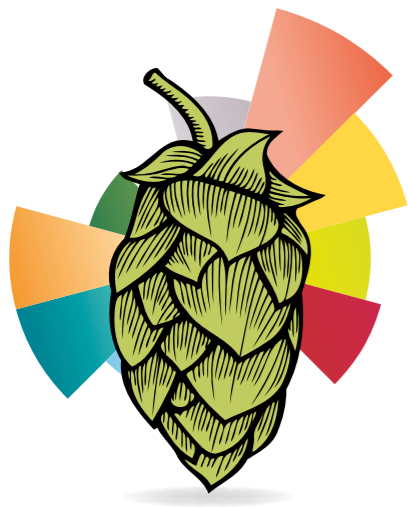
Galaxy® contributes prominent passion fruit, peach and citrus aromas. It also has subtle notes of spice, such as aniseed and fennel, in a fruity combination with cassis, blueberry, blackberry and raspberry. Gooseberry can also be detected.

Average Key Flavors since 2018



Topaz™

Harvest 2022



Key Flavors 2022



Topaz™ was created by the HPA breeding program in 1985 and commercialised in 1997. The cross pollination of high alpha Australian and Wye College hops provides an exotic mix of English, European and North American heritage that really shines in sessional settings.

ANALYSIS VALUES

Growing Area	Australia
Heritage	High Alpha Australian and Wye College
Alpha Acids*	13.0 - 18.0 %
Total Polyphenols	no data
Total Oil	1.7 - 2.2 ml/100 g
Beta Acids	no data

% OF TOTAL OIL

Myrcene	35.0 - 55.0 %	Geraniol	0.2 - 0.3 %
Linalool	0.3 - 0.6 %	Terpene esters & -alcohols	0.8 - 1.0 %
Humulene	8.0 - 13.0 %	Ketones	5.0 - 6.0 %
Caryophyllene	7.0 - 13.0 %	Isobutyrate	2.0 - 3.0 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	3.0 - 4.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

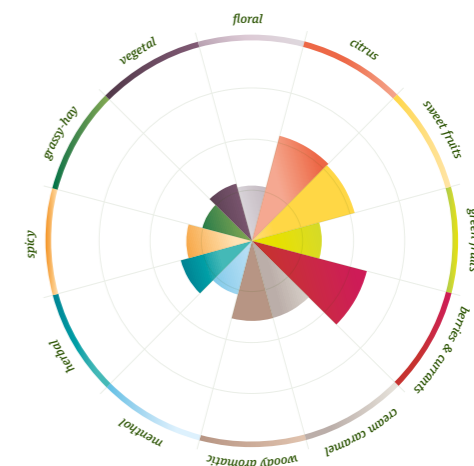
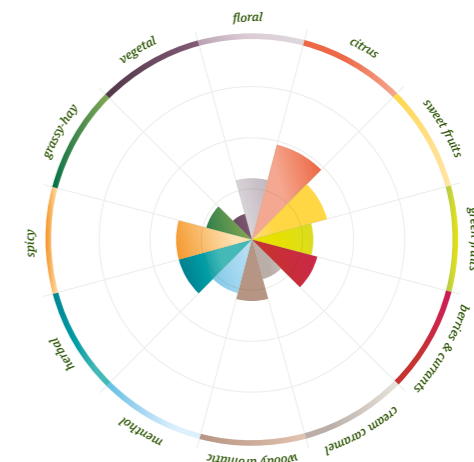
Actually Topaz™ offers quite a different aroma profile in 2022. Grapefruit aroma meets green tea with a touch of cream, while a hint of blackcurrant completes the experience.

i For your brewing: The berry character of Topaz™ is considerably lower in the 2022 harvest. Apart from that, the intensity is slightly lower to the usual aroma profile. Partial use of Topaz™ harvest 2021 or varieties strong in berries like Chinook, Citra® and Talus™ can help boost the aroma.

TYPICAL AROMA PROFILE

This aroma variety combines the characteristic earthy notes of traditional English varieties with the fruity aromas of lychee and blackcurrant, rounded out with grapefruit and resinous notes.

Average Key Flavors since 2018



Vic Secret™

Harvest 2022



Key Flavors 2022



The story of Vic Secret™ began in 2000 when it was created by the HPA breeding program, and later commercialised in 2013. For a time, this result of a cross pollination of high alpha Australian female and Wye College male genotype was known by few brewers. Now the variety brings dank and refreshing notes to beers around the world.

ANALYSIS VALUES

Growing Area	Australia
Heritage	High Alpha Australian and Wye College
Alpha Acids*	14.0 - 17.0 %
Total Polyphenols	no data
Total Oil	2.2 - 2.8 ml/100 g
Beta Acids	6.5 - 8.0 %

% OF TOTAL OIL

Myrcene	52.9 - 52.9 %	Geraniol	0.1 - 0.2 %
Linalool	0.4 - 0.7 %	Terpene esters & -alcohols	0.8 - 1.0 %
Humulene	9.4 - 12.2 %	Ketones	4.0 - 5.0 %
Caryophyllene	8.8 - 10.7 %	Isobutyrate	3.0 - 4.0 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	20.0 - 26.0

* The alpha content is determined by means of spectrophotometric analysis.

HARVEST 2022

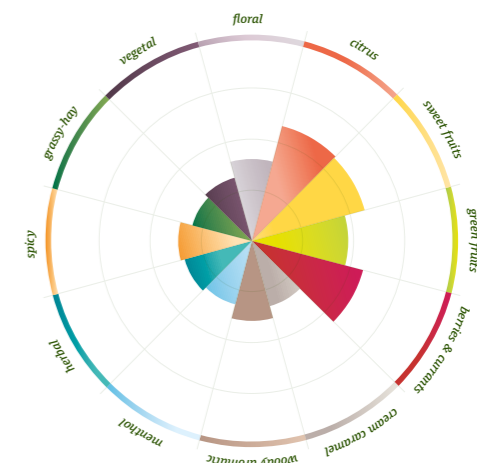
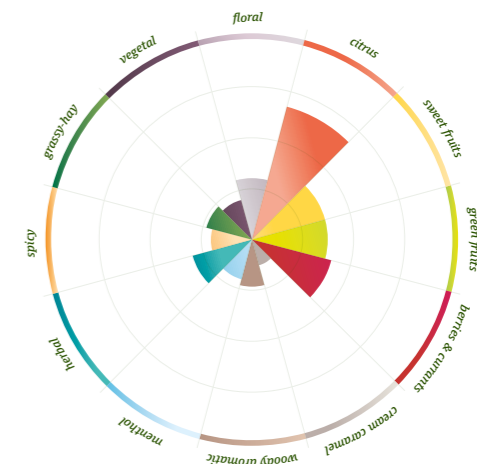
In 2022 Vic Secret™ is stronger in citrus flavors but retains it's characteristic profile.

i For your brewing: The characteristic fruity aroma profile of Vic Secret™ is comparable to the average profile. There is no need to change anything in your brewing recipes when using Vic Secret™ – you might consider increasing the dosage slightly.

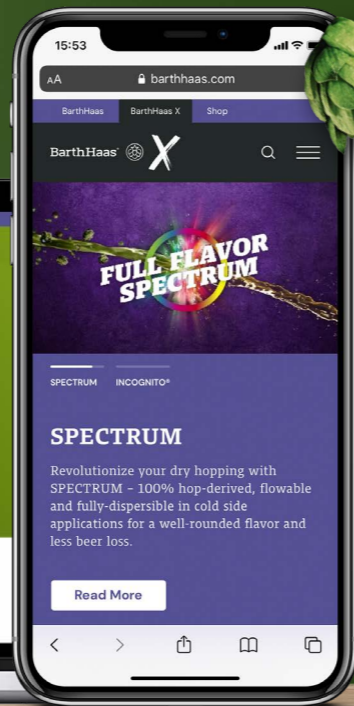
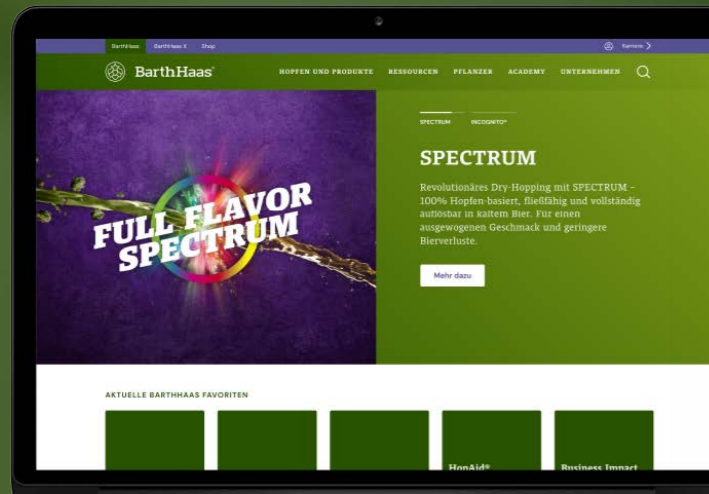
TYPICAL AROMA PROFILE

This variety is characterized by many tropical fruit aromas such as pineapple and passion fruit. Note of pine, grapefruit and bergamot add a certain freshness to the mix.

Average Key Flavors since 2018



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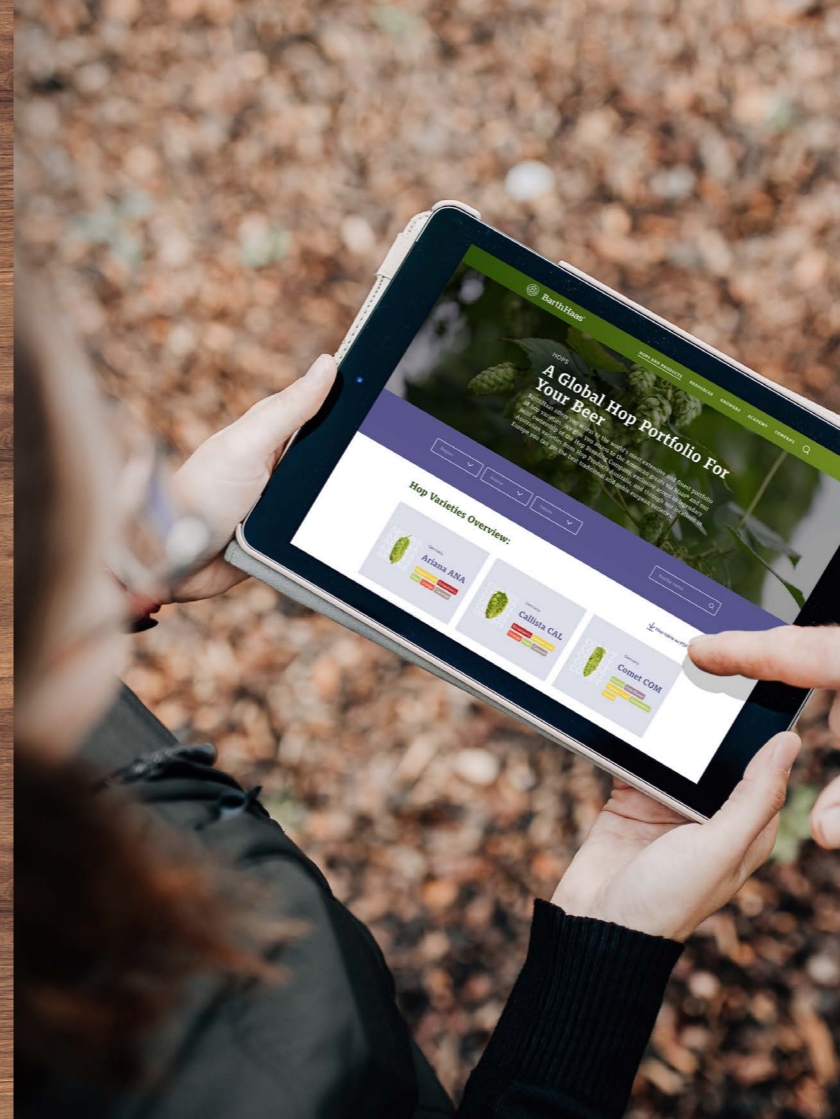
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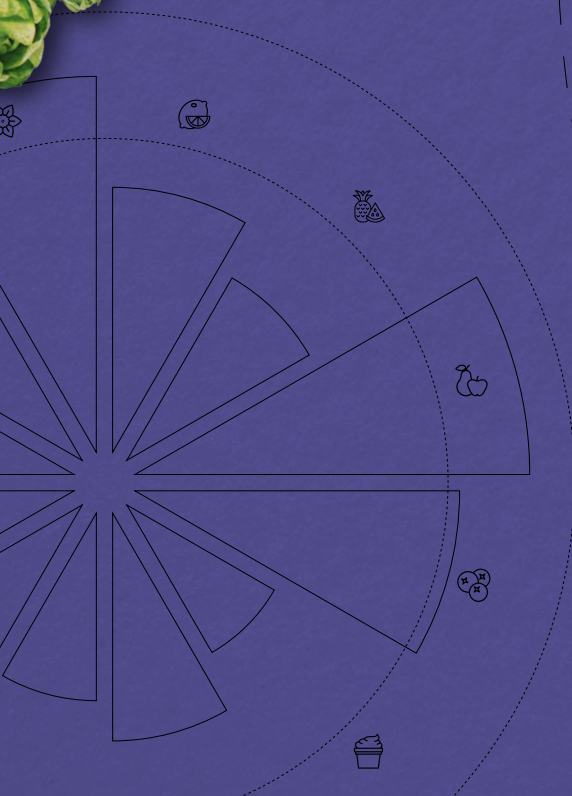
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menthol

woody aromatic

cream caramel

