



BarthHaas®

HOP HARVEST GUIDE 2021

*Inspiration and knowledge
to create the best beer*



Hop Harvest Guide 2021

*The guide to making wonderful beers
with hops from the 2021 harvest*

Like every year, we have been intensively studying the aroma of each hop variety. As a result, we'd like to take you on a journey through the wonderful world of hop aromas in the Hop Harvest Guide 2021!

While in most of Europe the growing and harvesting conditions for hops were optimal, there was a heat wave in the USA and Slovenia that created suboptimal conditions for hop growing. This is reflected in the aroma intensities and alpha values. In Europe, both aroma intensities and alpha values are higher than in previous years. However in the U.S. and Slovenia, we see a lower intensity here.

Accompany us through the hop-growing regions of the world and let us inspire you with the aroma characteristics of this year's harvest.

Did you know that hops can smell like red fruits, such as strawberries? Our 12 aroma categories can help you find the perfect hops for your exceptional beers. The Brewing Solutions team hopes you enjoy diving into the multi-faceted world of aromas with the 2021 Hop Harvest Guide, and we wish you the best in creating great-tasting beers.

Dr. Christina Schönberger



Hop Harvest Guide 2021

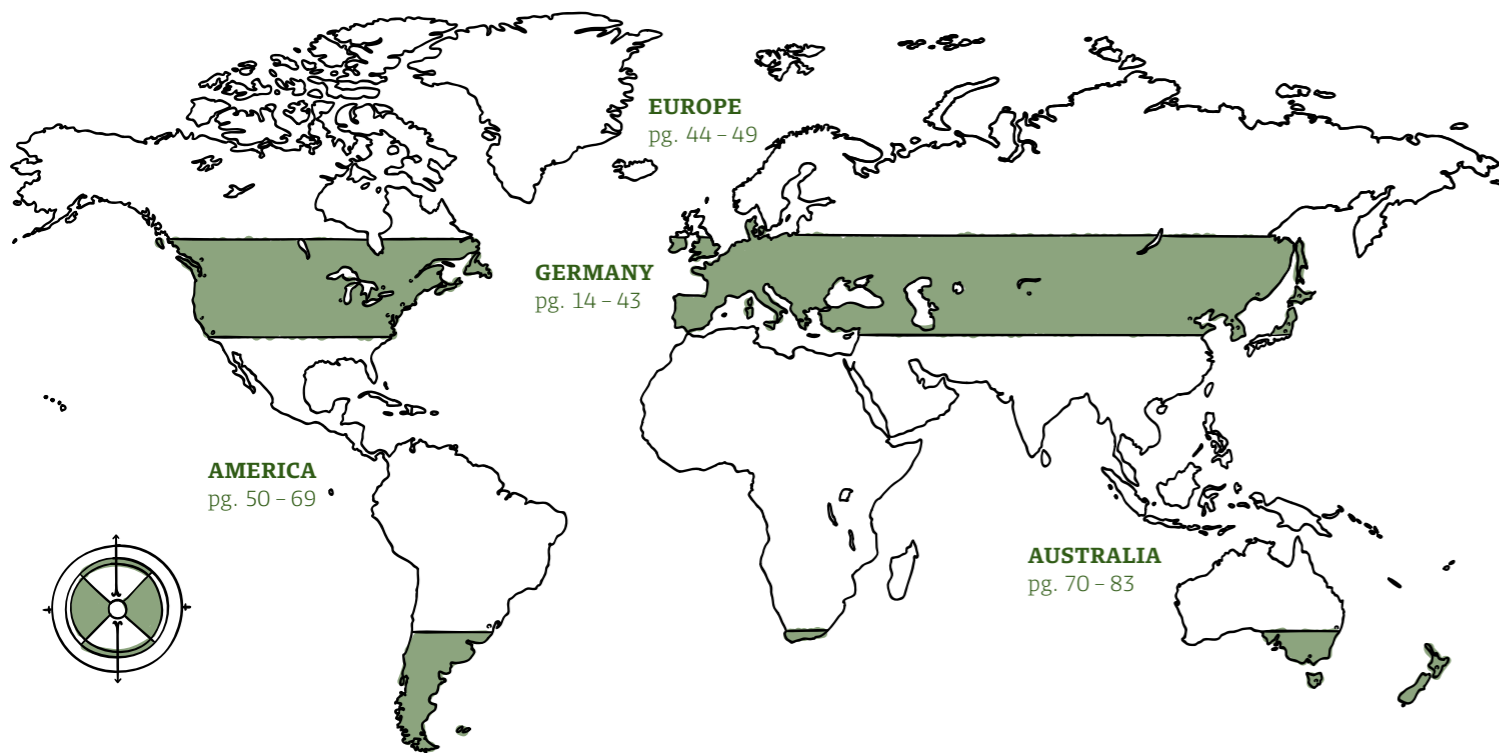


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Hop aroma – Smelling vs Measuring: What kind of information is relevant to the brewer?

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 to recognise their ingredients by heart.

Many analytical values have been established to describe hops. Alpha acid is important to calculate the bitterness in beer. The HSI (Hop Storage Index) tells brewers how fresh the hops are that they are using, and 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 a lot of single components in hop oil?



What compounds can be found in hop oil?

With the addition of hops, more than 800 aroma components are added to beer, of which only 485 have been identified. Depending on their molecular nature, those single components differ in volatility and are vaporised to different extents with higher temperatures. 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”, while 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 hop oil volume, but they are still 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, but using US Cascade hops, this intensity difference may not be as big due to the presence of thiols.

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

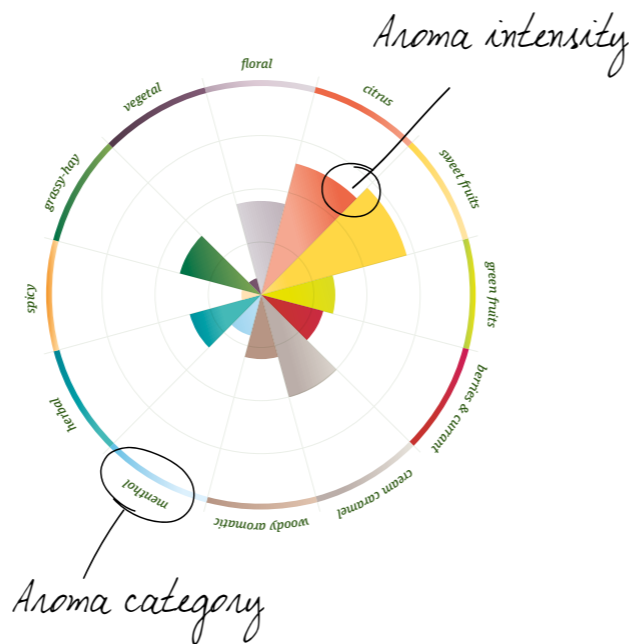
For a few years now we have been offering sensory training to brewers using our HOPSESSED® language. We work with 12 categories and within these categories we have more than 100 specific descriptors e. g. grapefruit, lavender, pineapple etc. All categories are rated with intensity values for each hop 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 DESCRIPTION

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 & currant

cassis, blueberry, raspberry, blackberry, strawberry, redcurrant, 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

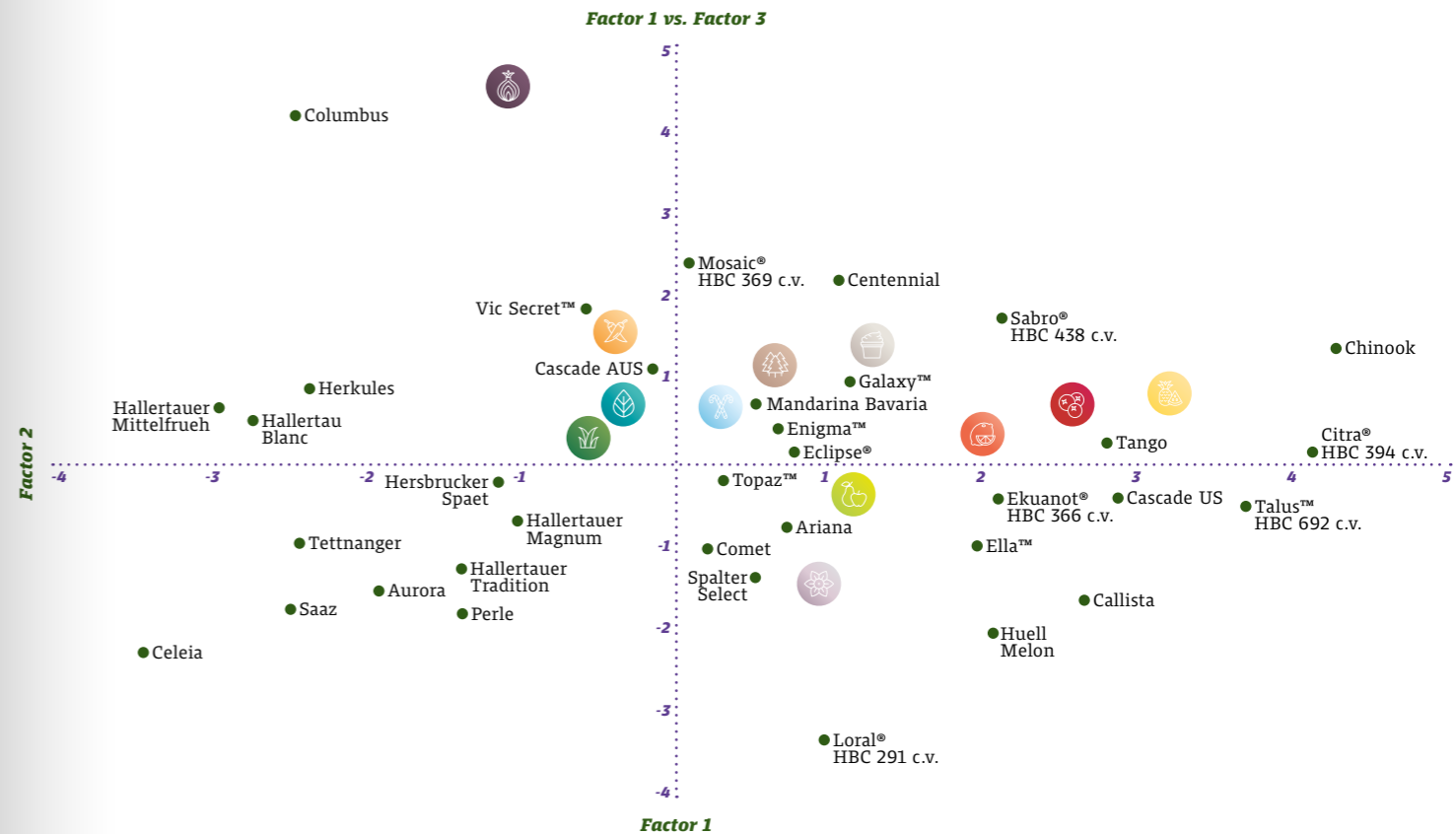
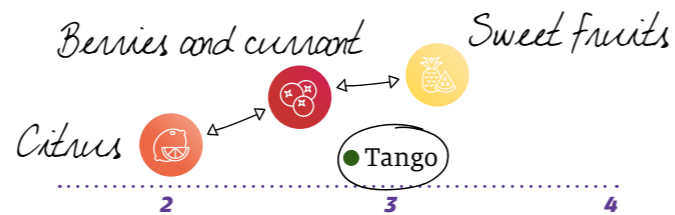
celery, leek, onion, artichoke, garlic, wild garlic, radish





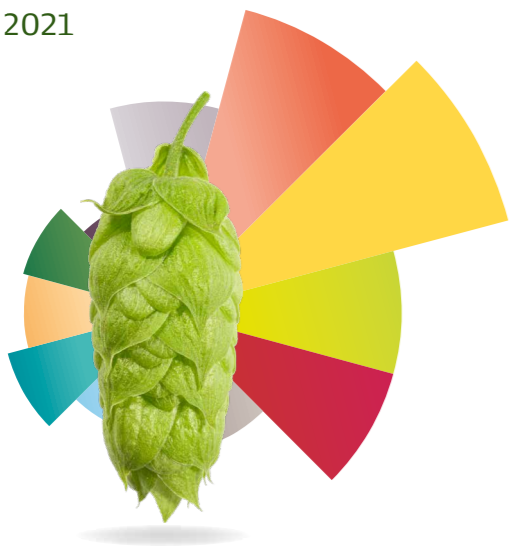
Hop variety visualisation by aroma category

This diagram shows all the hop varieties presented in this Harvest Guide sorted according to their aroma. It is based on our sensory data. The closer a variety is to an aroma descriptor, the more important that category is for that variety. For example, Tango is very close to the berries and currant category. The next closest descriptors are citrus and sweet fruits. These three categories describe Tango well.



Ariana

Harvest 2021



Key Flavors 2021

- Passion Fruit
- Pineapple
- Quince
- Tangerine
- Grapefruit

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 %	Terpenesters & -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.

ARIANA

HARVEST 2021

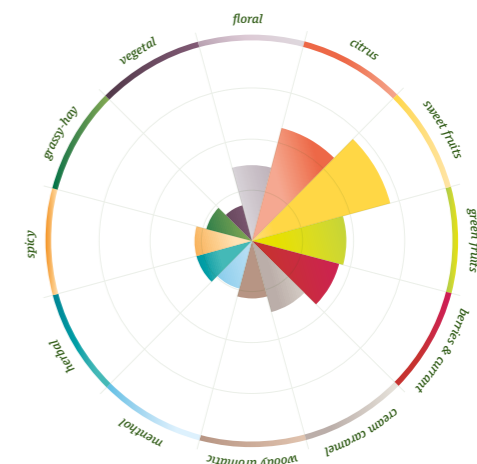
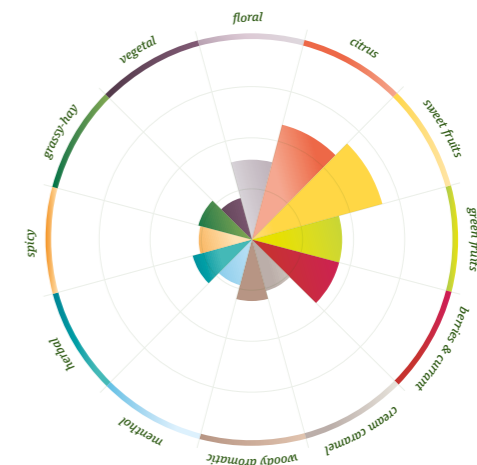
Again this year, Ariana shows itself to be a real multi-fruit bomb, enticing with sweet fruits like passion fruit and pineapple. This sweetness is balanced with notes of grapefruit and tangerine. A hint of quince rounds out the experience.

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

- Passion Fruit
- Pineapple
- Quince
- Tangerine
- Lime



Callista

Harvest 2021



Key Flavors 2021



This variety was bred in Huell under the name 2010/008/033. It is descended exclusively from 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 %	Terpenesters & -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.

CALLISTA

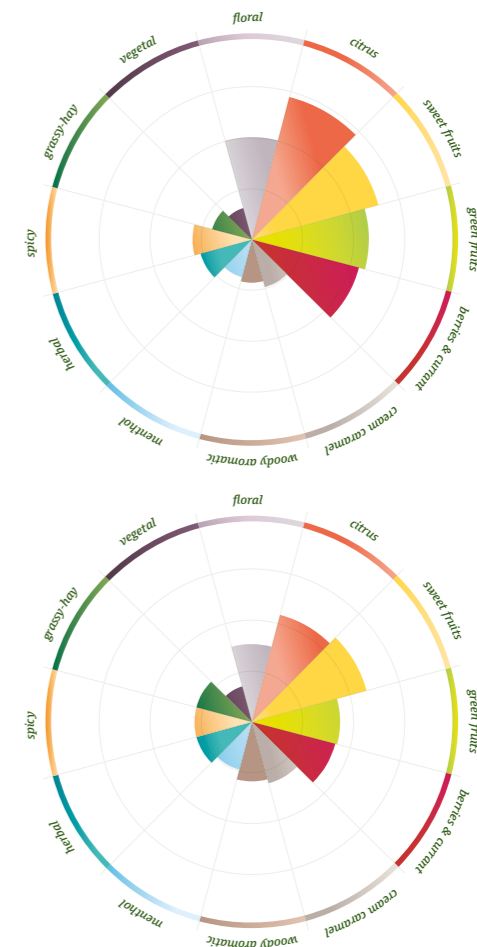
HARVEST 2021

Callista truly lives up to its name in 2021. Aroma of citrus fruits like grapefruit and orange combine with passion fruit and gooseberry to form a delicious fruit cocktail. Refreshing notes of camphor give this year's Callista an outstanding twist.

TYPICAL AROMA PROFILE

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

Average Key Flavors since 2018



Comet

Harvest 2021



Key Flavors 2021



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 produced by only a few growers.

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	no data
Linalool	no data	Terpenesters & -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.

COMET

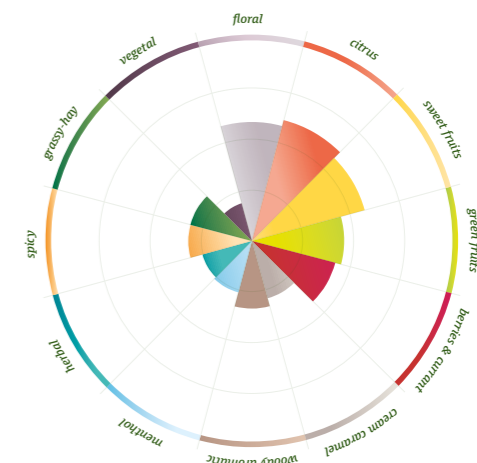
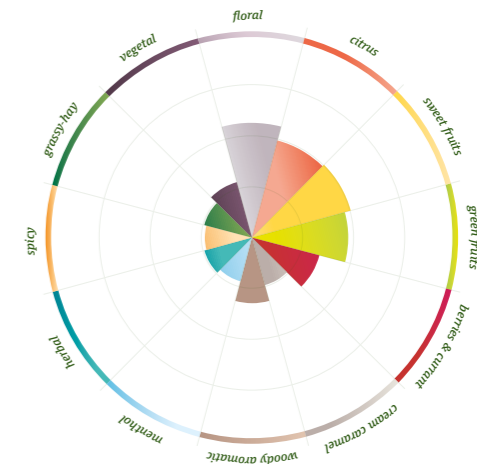
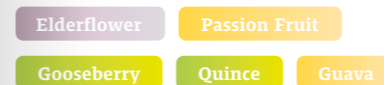
HARVEST 2021

Aromatically, Comet is a variety you can simply rely on. The extraordinary notes of elderflower are complemented with green fruits like quince and gooseberry. This year, sweet passion fruit and woody-floral lavender give Comet a special note.

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 2021



Key Flavors 2021

Grapefruit

Muscatel

Lemongrass

Cucumber

Gooseberry

This variety was bred in Huell from Cascade and a male Huell breeding line and was released in 2012. 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	no data
Linalool	0.3 - 0.5 %	Terpenesters & -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.

HALLERTAU BLANC

HARVEST 2021

What is it that makes Hallertau Blanc special? The white wine-like and sulphuric-grapefruit aromas. Add a hint of lemongrass and supplement with gooseberry and cucumber, then you have the refreshing bouquet of 2021 Hallertau Blanc.

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

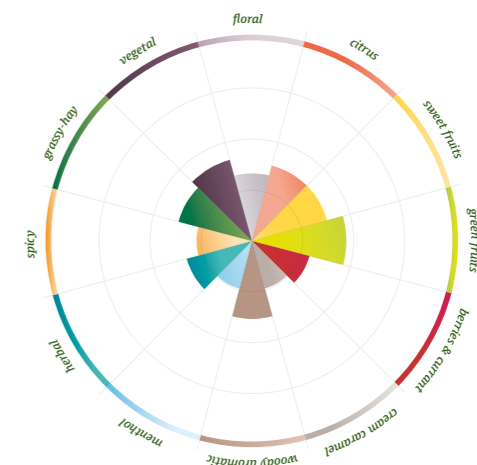
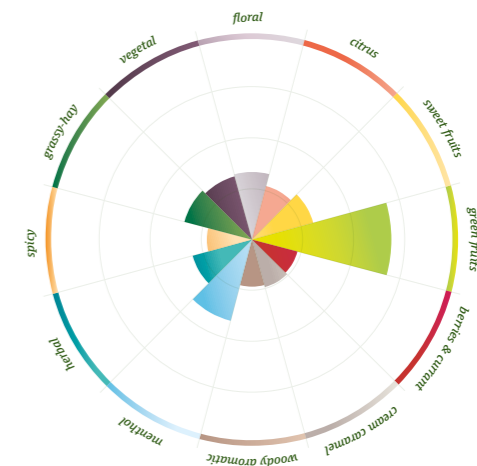
Grapefruit

Muscatel

Lemongrass

Cucumber

Quince



Hallertauer Magnum

Harvest 2021



Key Flavors 2021



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	no data	Geraniol	no data
Linalool	no data	Terpenesters & -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.

HALLERTAUER MAGNUM

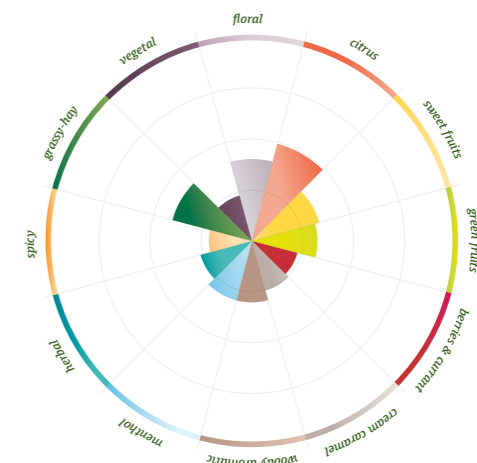
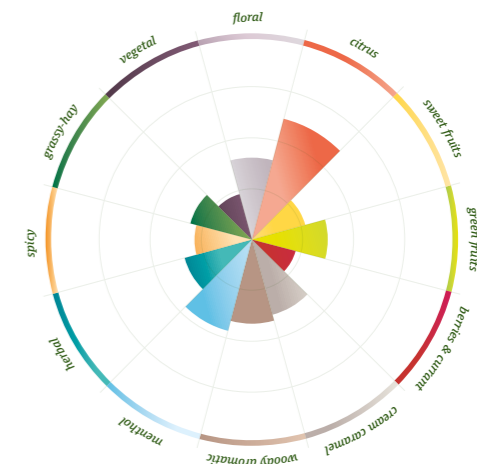
HARVEST 2021

Magnum tends to be underestimated, even though this hop variety delivers peppery and resinous notes that are unmatched in Europe. These aroma extremes are balanced in an elegant way by orange and cream.

TYPICAL AROMA PROFILE

Hallertau 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 2021



Key Flavors 2021

Red Currant

Lilac

Carnation

Bergamot

Resin

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 %	Terpenesters & -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.

HALLERTAU MITTELF RUEH

HARVEST 2021

The graceful land variety Hallertau Mittelfrueh gives us another year in which it entices us with splendid aromas. The scents of fresh red currant and bergamot are underscored by enchanting lilac and resinous-woody notes.

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

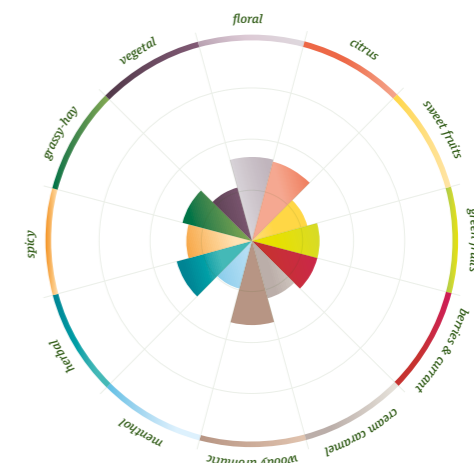
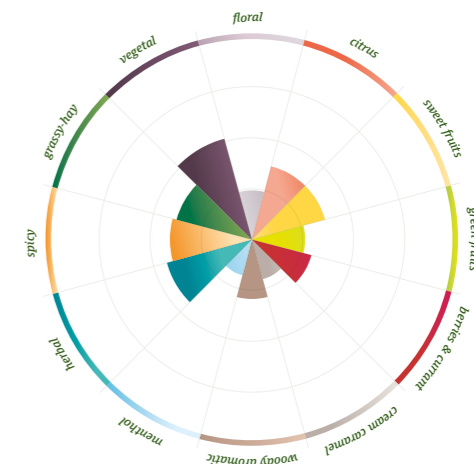
Lilac

Carnation

Lemon

Red Currant

Myrrh



Hallertauer Tradition

Harvest 2021



Key Flavors 2021



As the traditional variety Hallertau Mittelfrueh was endangered due to its high susceptibility to wilt, a successor with similar brewing properties was sought. Hallertauer Tradition was successful in both agronomic and brewing trials and was 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 Mittelfrueh.

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 %	Terpenesters & -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.

HALLERTAUER TRADITION

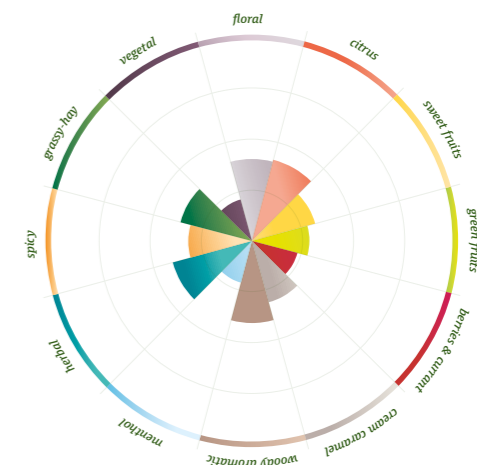
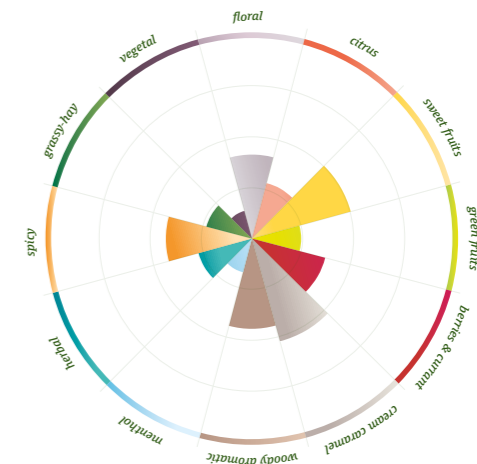
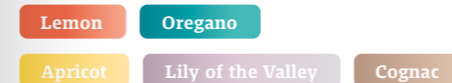
HARVEST 2021

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.

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



GERMANY

Hersbrucker Spaet

Harvest 2021



Key Flavors 2021

Lemongrass

Chamomile

Kiwi

Black Tea

Lemon

Hersbrucker Spaet is a traditional variety with a balanced aroma and a low bitter alpha acid content. It is very robust and has a good tolerance towards diseases, although 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	Terpenesters & -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.

HERSBRUCKER SPAET

HARVEST 2021

It is rare to find a well-balanced hop variety such as Hersbrucker Spaet. Lemony freshness is complemented by chamomile and rounded off with a slight kiwi fruitiness. Just add a pot of black tea and a relaxing day's end is complete.

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

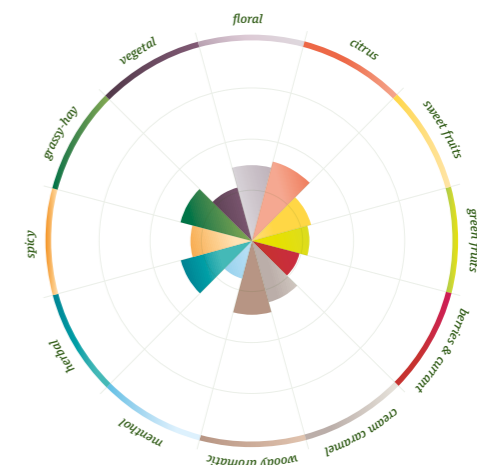
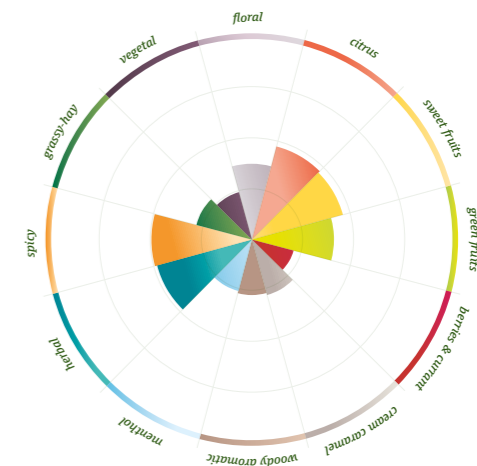
Lovage

Chamomile

Kiwi

Lemon

Apple Blossom



Herkules

Harvest 2021



Key Flavors 2021



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 %	Terpenesters & -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.

HERKULES

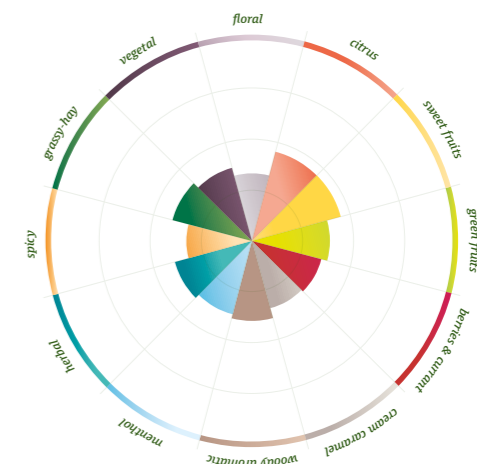
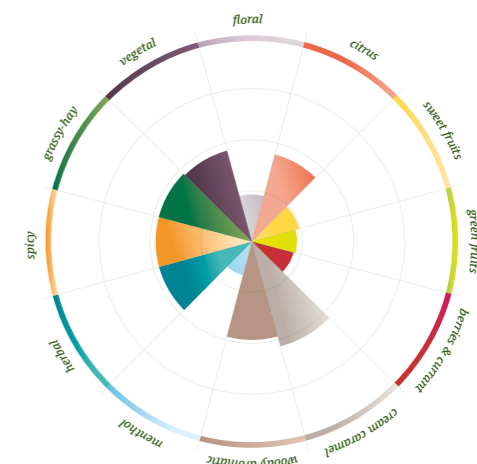
HARVEST 2021

Already a venerable variety, but not yet exhausted its potential. That is exactly the way Herkules presents itself in 2021. Fresh lemon balm and lemongrass complete green notes of tomato leaves. Apricot and black tea ground the freshness before it becomes overwhelming.

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 2021



Key Flavors 2021



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 %	Terpenesters & -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.

HUELL MELON

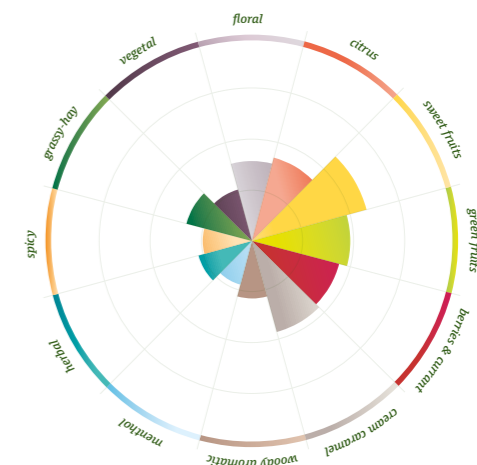
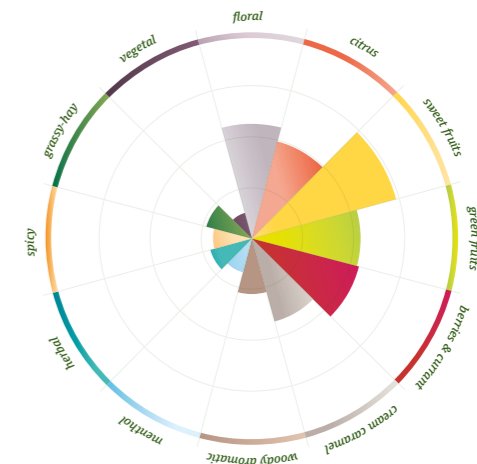
HARVEST 2021

Huell Melon really catapults us back to our childhood. The aroma of strawberry and caramel is strongly reminiscent of the candy Grandma used to hand out. Pear and yogurt complete the balanced profile.

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 2021



Key Flavors 2021

Tangerine

Strawberry

Gooseberry

Black Currant

Orange

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 %	Terpenesters & -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.

MANDARINA BAVARIA

HARVEST 2021

Fresh-fruity would be a fitting synonym for Mandarina Bavaria. Tangerine and orange meet gooseberry and red fruits for an enchanting dance.

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

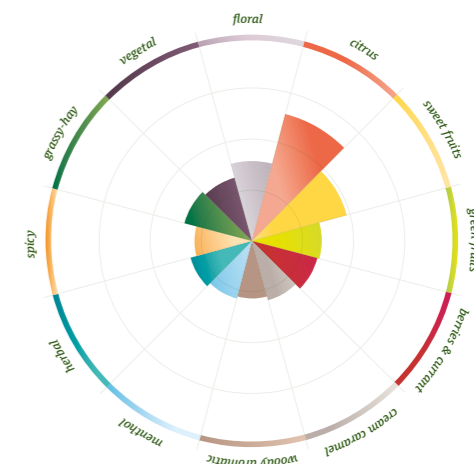
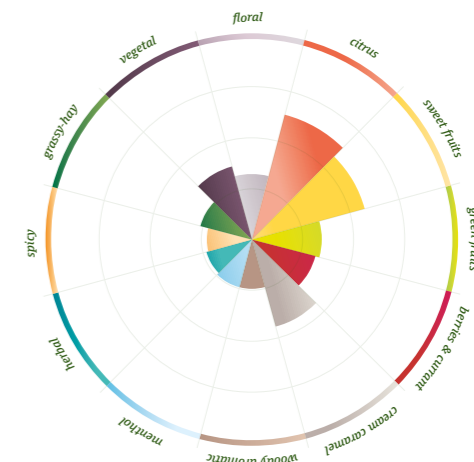
Tangerine

Strawberry

Gooseberry

Orange

Rosemary



Perle

Harvest 2021



Key Flavors 2021



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 aromas with high disease resistance and exceptional yields.

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 %	Terpenesters & -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.

PERLE

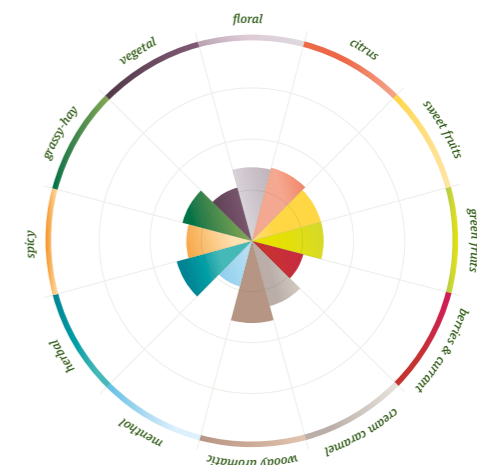
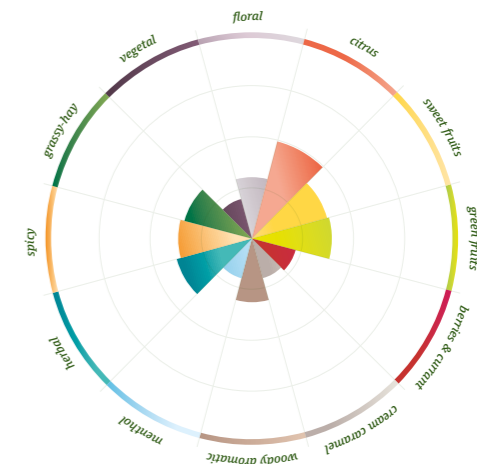
HARVEST 2021

The "pearl" of the Hallertau brings us fine aromas for another year. 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.

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 2021



Key Flavors 2021



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 %	Terpenesters & -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.

SPALTER SELECT

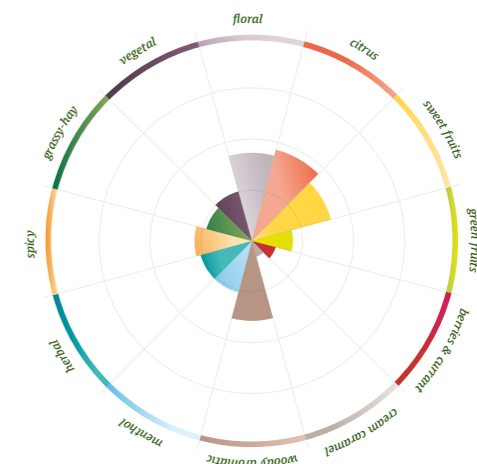
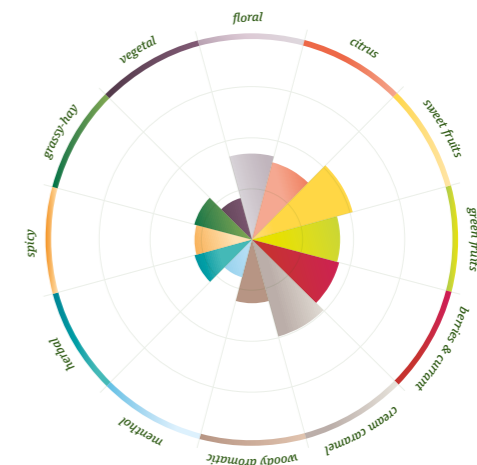
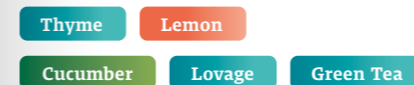
HARVEST 2021

Spalter Select in 2021 is surprisingly extraordinary. Herbal notes of thyme and lovage are complemented by unexpected passion fruit, lemon and cucumber.

TYPICAL AROMA PROFILE

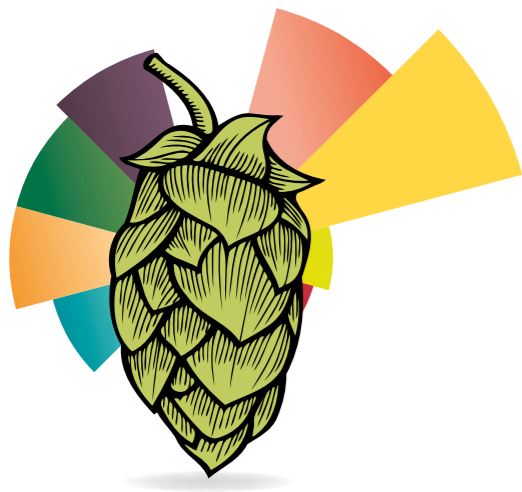
Spalter Select offers a range of unusual aromas, combining thyme and apple blossoms with spicy-herbal wormwood and tart citrus fruits.

Average Key Flavors since 2018



Tango

Harvest 2021



Key Flavors 2021

Lemon

Passion Fruit

Apple

Resin

Grapefruit

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

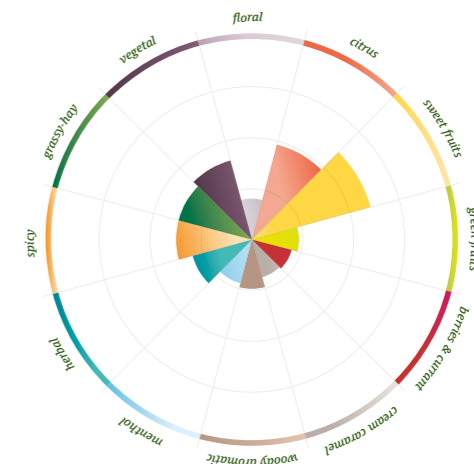
Myrcene	58.0 - 60.0 %	Geraniol	1.0 - 1.2 %
Linalool	0.3 - 0.5 %	Terpenesters & -alcohols	0.3 - 0.5 %
Humulene	0.0 - 10.0 %	Ketones	1.2 - 1.4 %
Caryophyllene	1.0 - 2.0 %	Isobutyrate	0.9 - 1.1 %
Farnesene	8.0 - 10.0 %	Thiols (µg/kg)	5.0 - 7.5

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

TANGO

HARVEST 2021

Dance the fruity tango and let yourself be carried off into the fantastic world of fresh fruit. Tango shows fruity aromas of passion fruit and grapefruit, and is rounded off with a resinous note finishing with fine lemon and apple. Tango can keep up with the famous international varieties.



Tettnanger

Harvest 2021



Key Flavors 2021



A traditional indigenous landrace variety from the Saaz group which is mainly cultivated around Tettngang on Lake Constance. The unique combination of the favorable climate by Lake Constance and sandy clay soils from 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 %	Terpenesters & -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.

TETTNANGER

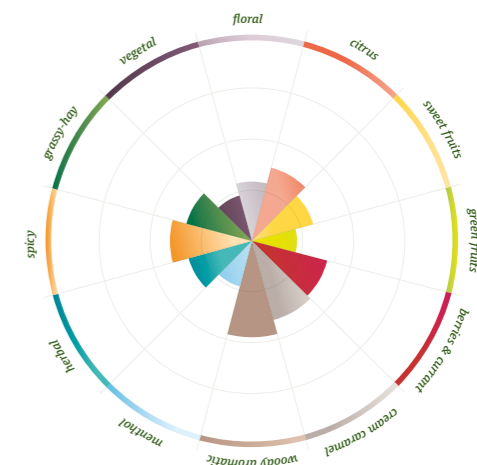
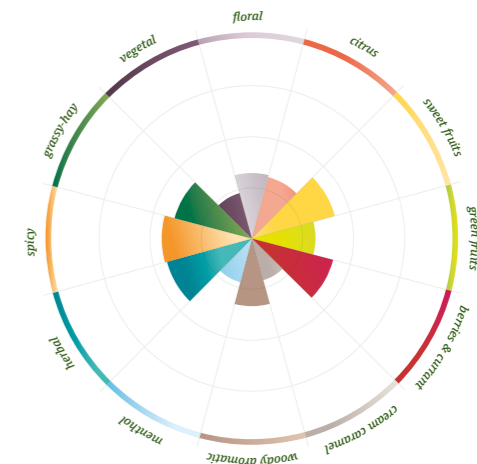
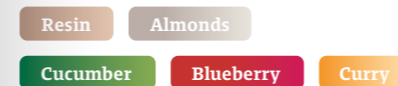
HARVEST 2021

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.

TYPICAL AROMA PROFILE

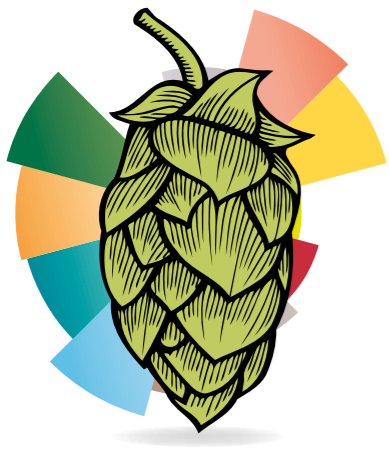
In the raw hops, woody aromas and cream caramel components, such as resin and almonds predominate, combined with fruity blueberry and spicy curry.

Average Key Flavors since 2018



Aurora

Harvest 2021



Key Flavors 2021



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

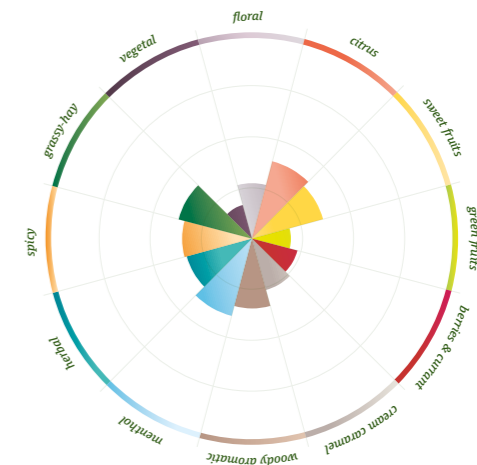
Myrcene	35.0 - 57.0 %	Geraniol	0.1 - 0.3 %
Linalool	0.5 - 0.8 %	Terpenesters & -alcohols	0.6 - 0.8 %
Humulene	12.0 - 14.0 %	Ketones	2.3 - 2.5 %
Caryophyllene	4.0 - 4.2 %	Isobutyrate	0.8 - 1.0 %
Farnesene	4.7 - 4.9 %	Thiols (µg/kg)	no data

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

AURORA

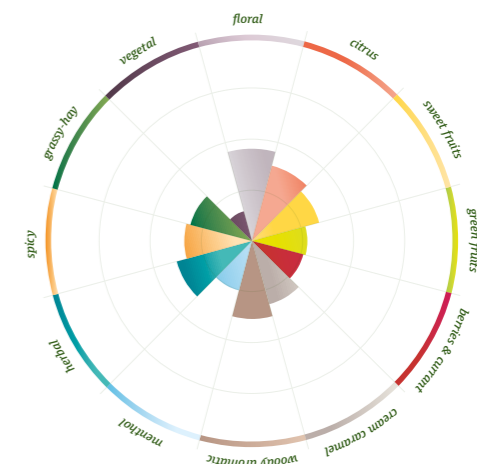
HARVEST 2021

Aurora, the break of dawn, shows its gorgeous face in 2021 with pleasant aromas of fresh hay and lime. Surprisingly, these aromas are combined with pepper and menthol, and are rounded out with hints of dried fruit.



TYPICAL AROMA PROFILE

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



Average Key Flavors since 2018



Celeia

Harvest 2021



Key Flavors 2021



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

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 %	Terpenesters & -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.

CELEIA

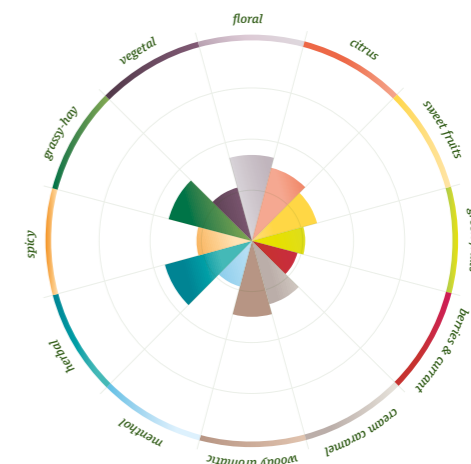
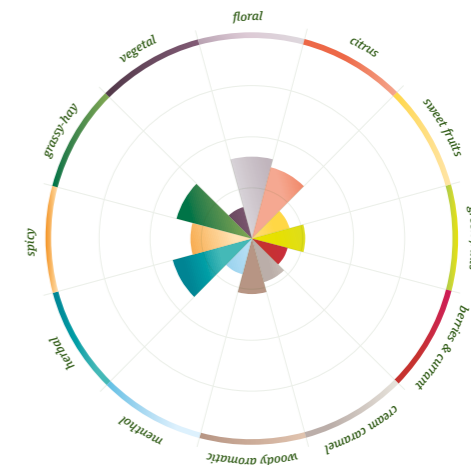
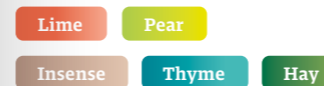
HARVEST 2021

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.

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 2021



Key Flavors 2021

- Thyme
- Geranium
- Cedar
- Hay
- Chamomile

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 %	Terpenesters & -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.

SAAZ

HARVEST 2021

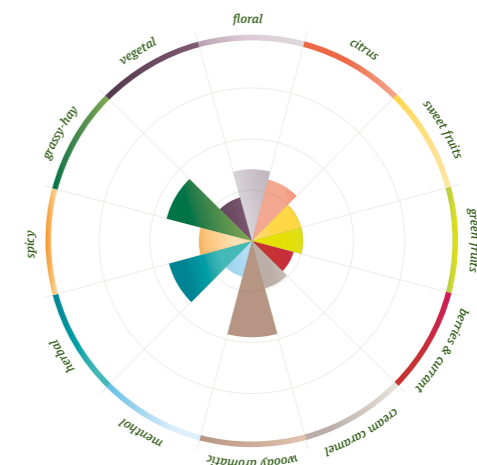
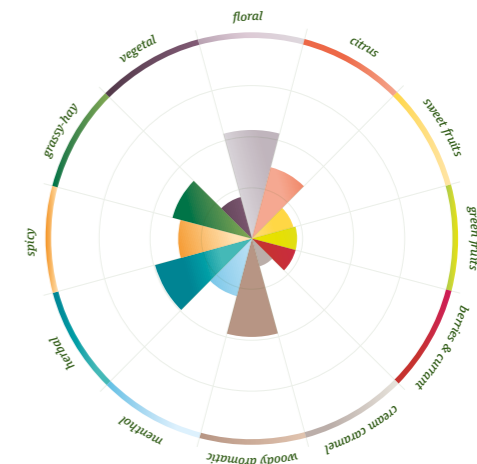
Saaz hops can surely be described as a long-serving variety. In spite of this, the reliable variety remains true to its typical profile: spicy - woody - herbal. Aromas of hay, thyme and cedar are lightened up by floral notes of chamomile and geranium.

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

- Thyme
- Geranium
- Pine
- Tobacco
- Hay



Cascade

Harvest 2021



Key Flavors 2021



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. It has a distinct fruity, citrusy aroma and was, for a long time, 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

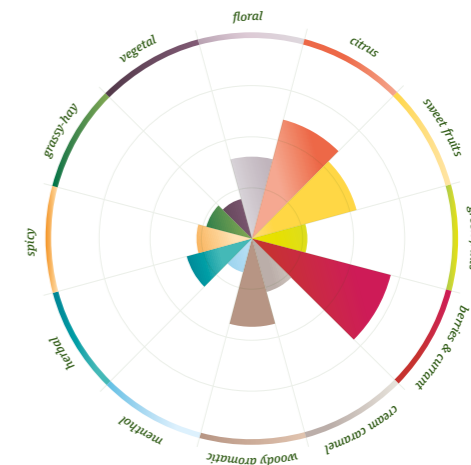
Myrcene	45.0 - 60.0 %	Geraniol	0.2 - 0.4 %
Linalool	0.3 - 0.6 %	Terpenesters & -alcohols	no data
Humulene	8.0 - 13.0 %	Ketones	no data
Caryophyllene	3.0 - 6.0 %	Isobutyrate	no data
Farnesene	3.0 - 7.0 %	Thiols (µg/kg)	no data

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

CASCADE

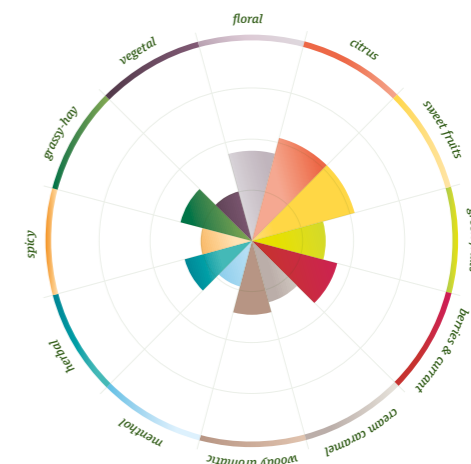
HARVEST 2021

Cascade surprises with intense notes of berries in 2021. Black currant enters into a balanced aroma to play with grapefruit. Additionally, find sweet peach and the aroma of roses.



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 raspberry sauce.



Average Key Flavors since 2018



Centennial

Harvest 2021



Key Flavors 2021

- Woodruff
- Pine
- Ginger
- Orange
- Blueberry

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 %	Terpenesters & -alcohols	no data
Humulene	10.0 - 18.0 %	Ketones	no data
Caryophyllene	5.0 - 8.0 %	Isobutyrate	no data
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

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

CENTENNIAL

HARVEST 2021

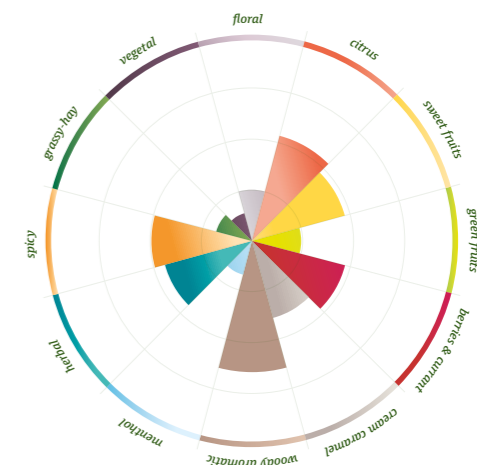
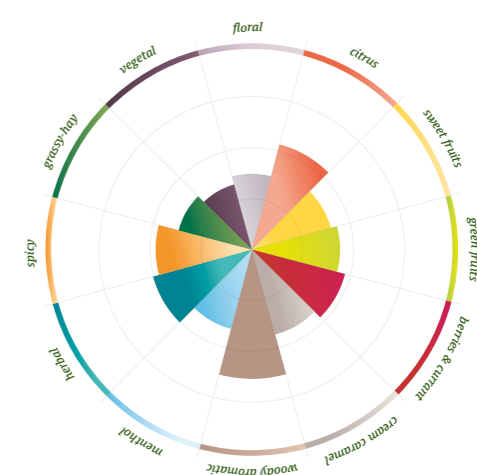
In 2021, Centennial is best described as citrus-resinous. Fresh ginger and pine needles dominate the aroma. This is softened by blueberry, orange and woodruff, thereby giving the variety a balanced overall character.

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

- Raspberry
- Bergamot
- Lychee
- Pineapple
- Pine



Chinook

Harvest 2021



Key Flavors 2021

- Pineapple
- Passion Fruit
- Lemon
- Resin
- Orange

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 %	Terpenesters & -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.

CHINOOK

HARVEST 2021

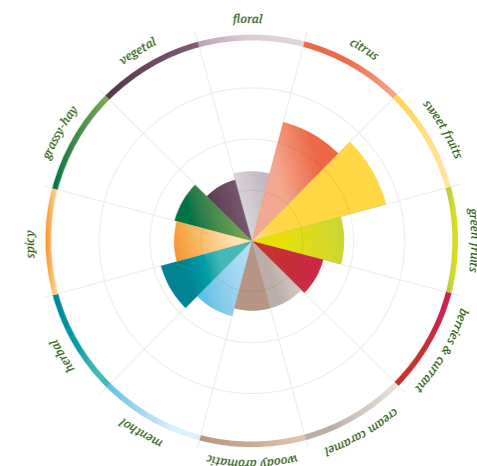
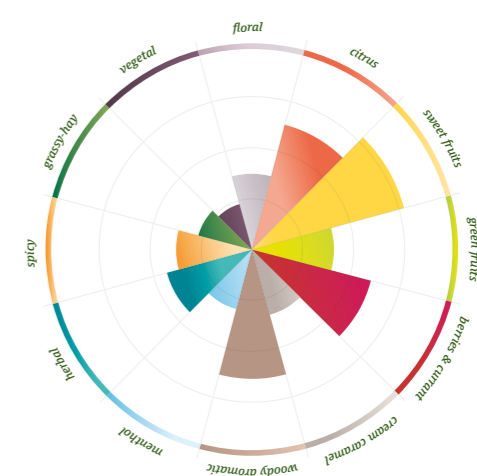
The typical resinous and citrus notes (lemon and orange) of Chinook is complemented in 2021 by exotic pineapple and passion fruit, which increases the complexity.

TYPICAL AROMA PROFILE

In its raw state, this hop has a herbal, almost smoky character 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

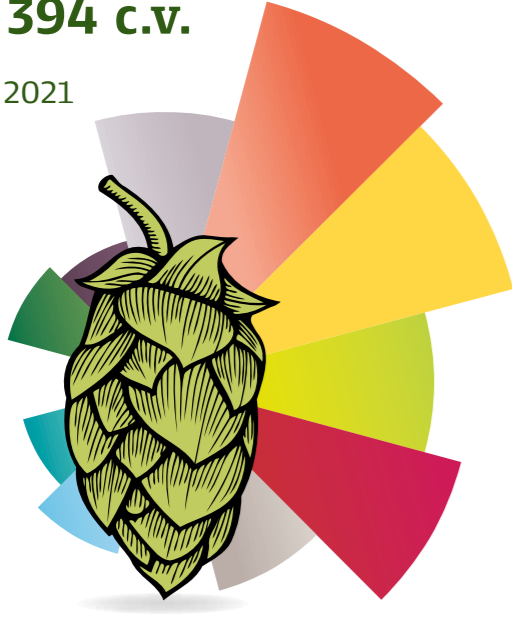
- Grapefruit
- Juniper
- Basil
- Orange
- Passion Fruit



Citra®

HBC 394 c.v.

Harvest 2021



Key Flavors 2021



Citra® (HBC 394 c.v.) was released in 2008 and is now the biggest US hop variety in terms of area. It was bred by the Hop Breeding Company (HBC) from Hallertau Mittelfrueh and a male descendant of Tettnanger.

ANALYSIS VALUES

Growing Area	United States
Heritage	50.0 % Hallertau. 25.0 % US Tettngang. 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 %	Terpenesters & -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.

CITRA® HBC 394 C.V.

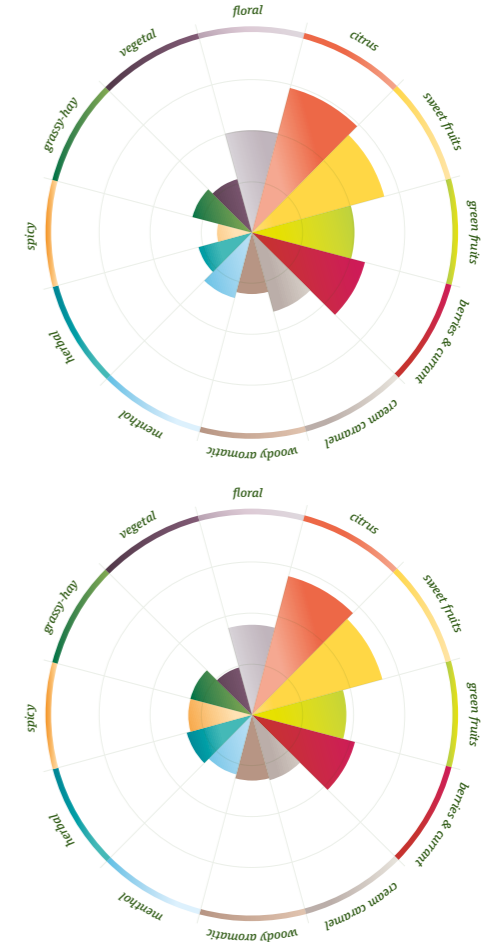
HARVEST 2021

Citra® is one of the aroma winners in 2021. In all of its aroma splendor, Citra® shines with passion fruit, lemongrass and raspberries. Geranium and pear must give it their best to keep up.

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 2021



Key Flavors 2021

- Onion
- Leek
- Fennel
- Dried Fruit
- Barrique

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 %	Terpenesters & -alcohols	no data
Humulene	9.0 - 14.0 %	Ketones	no data
Caryophyllene	6.0 - 10.0 %	Isobutyrate	no data
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

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

COLUMBUS

HARVEST 2021

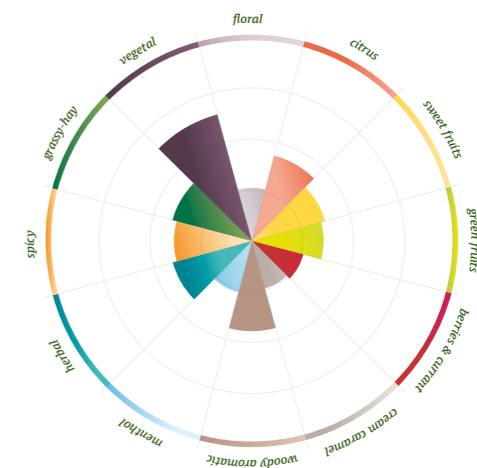
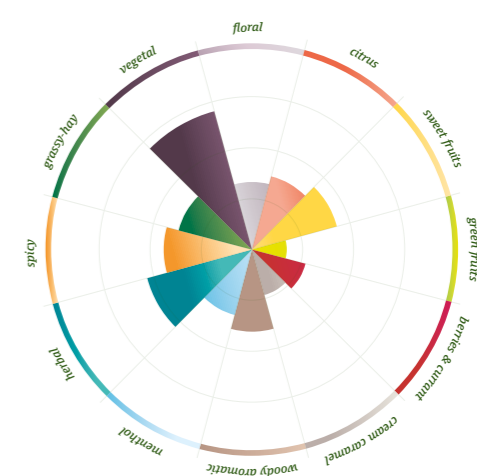
Columbus stays true to its vegetal character. A lot of onion and leek determine its aroma. After smelling for a second time, you will be surprised with dried fruit, fennel and notes of an oak barrel.

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

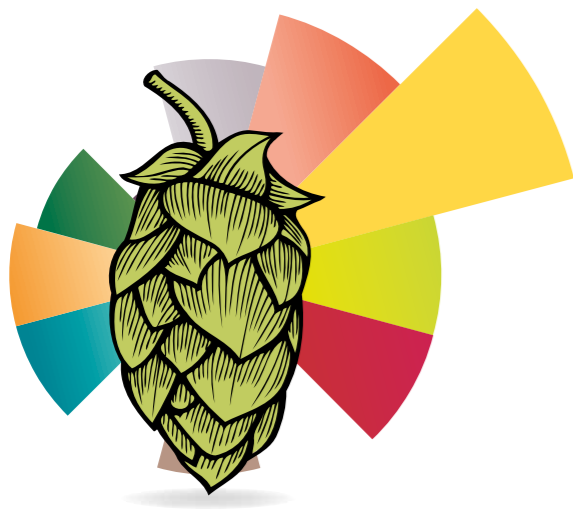
- Ginger
- Leek
- Tomato Leaves
- Fennel seeds
- Onion



Ekuanot®

HBC 366 c.v.

Harvest 2021



Key Flavors 2021



When the earth and the sun align, a new variety of hops is born. During early Spring, Ekuanot® comes out of the ground as a bright lime green variety. Over the course of the summer, it gradually turns into a rich, dark green. Equal light, equal dark - Ekuanot®. These hops are generally some of the most sought-after in the industry. The diversified and pronounced aroma characteristics combined with extremely high oil content and a tight cone structure make this hop variety unique.

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	Terpenesters & -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.

EKUANOT® HBC 366 C.V.

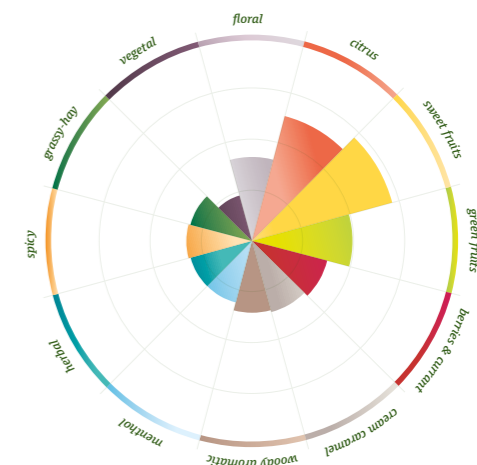
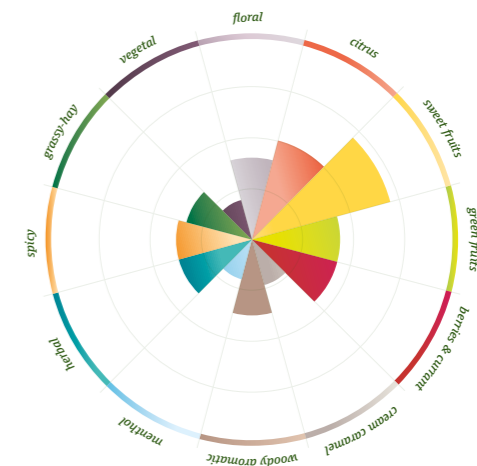
HARVEST 2021

The fruit bomb Ekuanot® lives up to expectations in 2021 and shows guava, passion fruit, grapefruit and blackcurrant in a great flavor combination. Ginger complements the exotic mixture with its freshness.

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. Black currants, gooseberries and grapes round off the flavor profile.

Average Key Flavors since 2018



USA

NEW

Loral® HBC 291 c.v.

Harvest 2021



Key Flavors 2021

Rose

Apple Blossom

Fresh Grass

Cherry

Red Currant

Loral® (HBC 291 c.v.) is an experimental cultivar that shows more traditional yet unique hop character with notes of herbal, floral, spicy that one would expect from a noble hop variety. Its mother is the U.S. developed aroma variety Glacier. The father of HBC 291 is a son of the U.S. developed commercial variety Nugget. HBC 291 has numerous small, dense cones with moderate alpha acids.

ANALYSIS VALUES

Growing Area	United States
Heritage	Daughter of U.S. Glacier & U.S. Nugget
Alpha Acids*	10.0 - 15.0 %
Total Polyphenols	no data
Total Oil	1.5 - 3.4 ml/100 g
Beta Acids	4.0 - 6.5 %

% OF TOTAL OIL

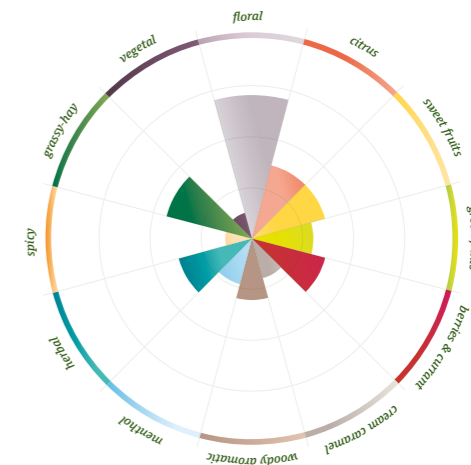
Myrcene	52.0 - 58.0 %	Geraniol	0.2 - 0.3 %
Linalool	0.5 - 1.3 %	Terpenesters & -alcohols	no data
Humulene	15.0 - 18.0 %	Ketones	no data
Caryophyllene	5.0 - 6.0 %	Isobutyrate	no data
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

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

LORAL® HBC 291 C.V.

HARVEST 2021

Loral® presents itself surprisingly different in comparison to the typical US citrus and fruity bombs - namely floral aromas like geranium and apple blossoms rendezvous with refined grass notes, a hint of cherry and red currant.

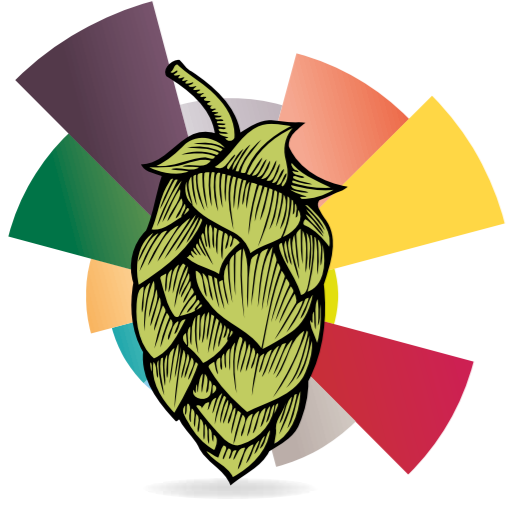


USA

Mosaic®

HBC 369 c.v.

Harvest 2021



Key Flavors 2021

- Passion Fruit
- Onion
- Grapefruit
- Ginger
- Red Currant

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 %	Terpenesters & -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.

MOSAIC® HBC 369 C.V.

HARVEST 2021

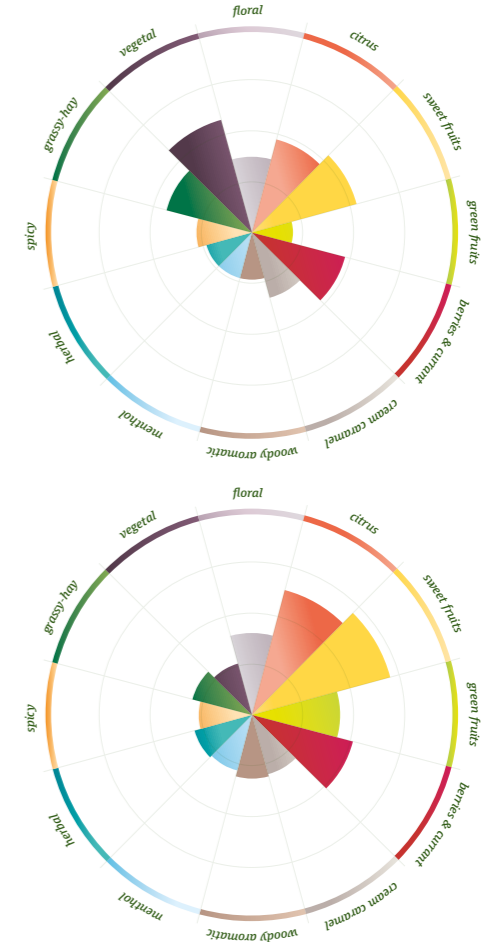
The aromas of the thiols split the response of tasters. And that is exactly what happened for Mosaic® in 2021. For some, Mosaic® is a typical fruit bomb with passion fruit, blackcurrant and grapefruit. For others, the aromas of fresh onions resonate.

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

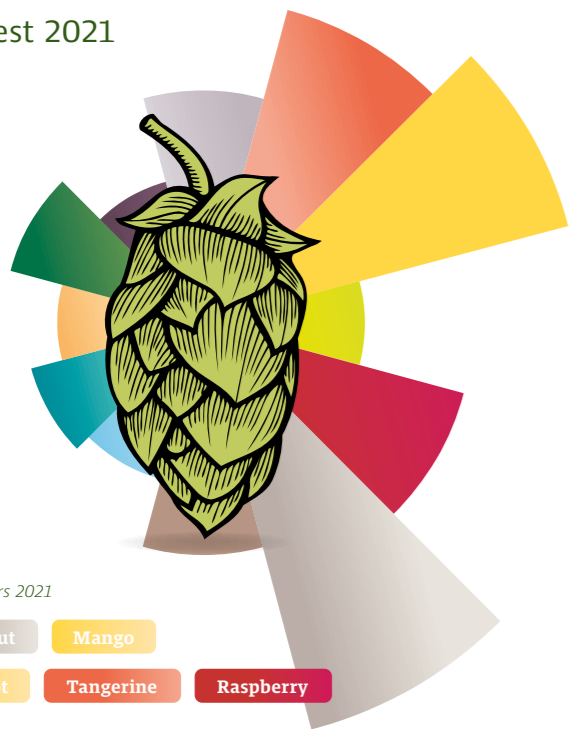
- Pineapple
- Mango
- Passion Fruit
- Gooseberry
- Onion



Sabro®

HBC 438 c.v.

Harvest 2021



Key Flavors 2021

- Coconut
- Mango
- Apricot
- Tangerine
- Raspberry

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 %	Terpenesters & -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.

SABRO® HBC 438 C.V.

HARVEST 2021

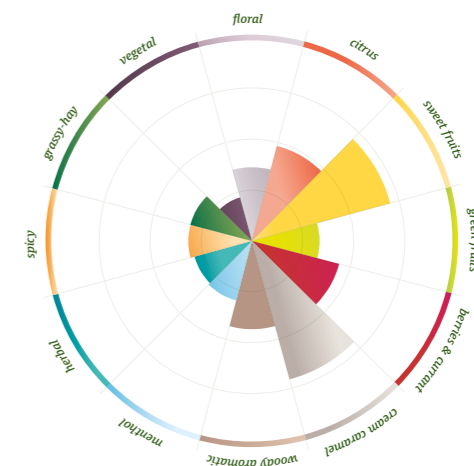
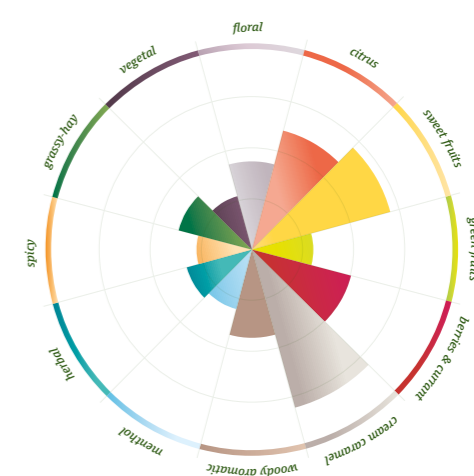
Sabro® reliably contributes strong and complex fruit flavors to beer with notes of tangerine, pineapple and peach. It also has a remarkable creaminess, with strong coconut and vanilla aromas. These are rounded off by hints of cedar, dill and mint.

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

- Coconut
- Passion Fruit
- Mango
- Grapefruit
- Vanilla



Talus™

HBC 692 c.v.

Harvest 2021



Key Flavors 2021

Mango

Peach

Grapefruit

Lime

Red Currant

Talus™ (HBC 692 c.v.) is the daughter of Sabro® (HBC 438 c.v.) and open pollination. This makes Talus™ a niece of a Neomexicanus hop variety. Neomexicanus varieties are the untamed wild hops of the American West, a rare type of subspecies that have been found growing in the mountainous regions of New Mexico and Arizona. 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

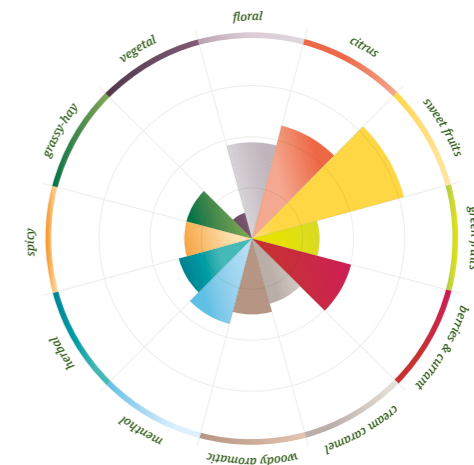
Myrcene	40.0 - 50.0 %	Geraniol	1.0 - 3.0 %
Linalool	0.0 - 1.0 %	Terpenesters & -alcohols	no data
Humulene	16.0 - 21.0 %	Ketones	no data
Caryophyllene	9.0 - 13.0 %	Isobutyrate	no data
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

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

TALUS™ HBC 692 C.V.

HARVEST 2021

Pink grapefruit and tropical aromas in 2021 are also the main aroma character for Talus™. These aromas are supplemented with the freshness of lime and red currants, which make it a tantalizing mixture.



USA

Cascade

Harvest 2021



Key Flavors 2021

- Mango
- Yogurt
- Grapefruit
- Chilli
- Geranium

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. It has a distinct fruity, citrusy aroma and was, for a long time, the most popular hop variety for craft brewing, before being overtaken by Citra® (HBC 394 c.v.).

ANALYSIS VALUES

Growing Area	Australia
Heritage	cross of English Fuggle with a male descendant of the Russian variety Serebrianka
Alpha Acids*	6.4 - 8.6 %
Total Polyphenols	no data
Total Oil	0.6 - 1.1 ml/100 g
Beta Acids	5.4 - 7.0 %

% OF TOTAL OIL

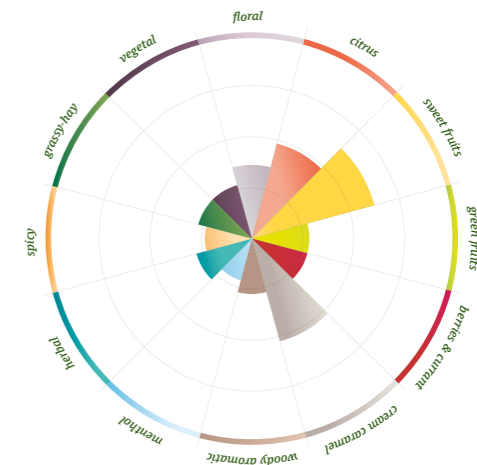
Myrcene	21.0 - 49.0 %	Geraniol	no data
Linalool	0.1 - 0.6 %	Terpenesters & -alcohols	no data
Humulene	15.3 - 30.1 %	Ketones	no data
Caryophyllene	5.8 - 9.4 %	Isobutyrate	no data
Farnesene	8.1 - 10.3 %	Thiols (µg/kg)	no data

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

CASCADE

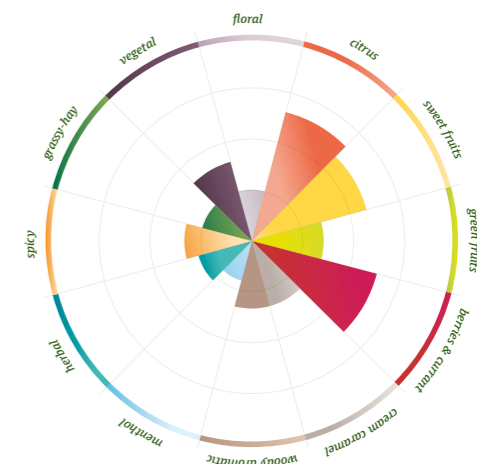
HARVEST 2021

This year, Cascade gives off a soft scent of mango lassi and pink grapefruit. A slight chili spice adds an exotic touch. Hints of geranium round out any rough edges.



TYPICAL AROMA PROFILE

Pink Grapefruit combined with passion fruit, mango and currants show Cascade with an Australian complexity.



Average Key Flavors since 2018

- Mango
- Passion Fruit
- Grapefruit
- Pepper
- Currant

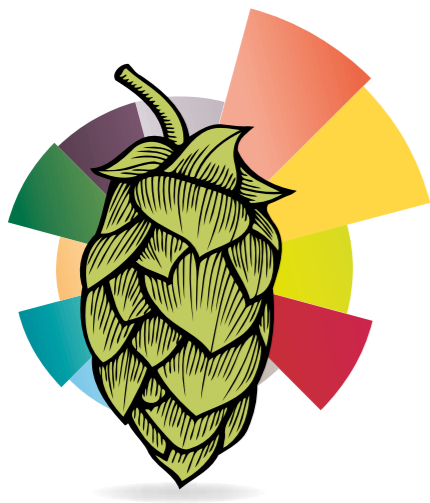


AUSTRALIA

NEW

Eclipse®

Harvest 2021



Key Flavors 2021

Grapefruit

Kiwi

Tangerine

Basil

Pine

Eclipse® was created by the HPA breeding program in 2004 and commercialized in 2020. Its ancestry is the result of cross pollination of high alpha Australian and North American hops.

ANALYSIS VALUES

Growing Area	Australia
Heritage	Heritage of Australian high alpha hops and American hops
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

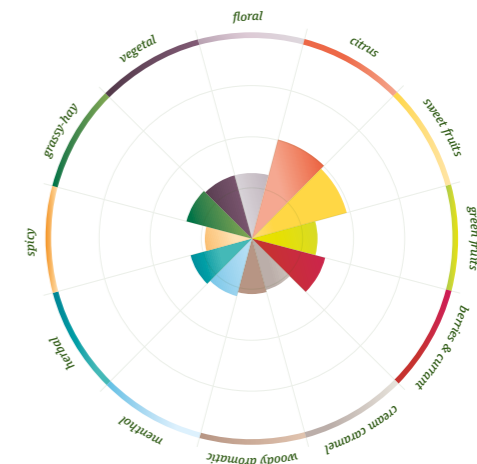
Myrcene	35.0 - 45.0 %	Geraniol	no data
Linalool	no data	Terpenesters & -alcohols	no data
Humulene	no data	Ketones	no data
Caryophyllene	5.0 - 15.0 %	Isobutyrate	no data
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	no data

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

ECLIPSE®

HARVEST 2021

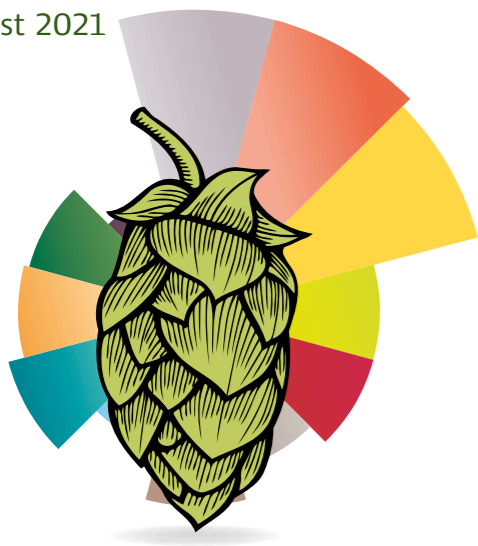
This hop variety refuses to be overshadowed, but shines brightly among the world of hops with its subtle aromatics. Sweet and sour fruits like kiwi, grapefruit and tangerine are given even more radiance with basil and pine in the background.



AUSTRALIA

Ella™

Harvest 2021



Key Flavors 2021



Ella™ is an aroma variety which grows vigorously, producing moderately large, dense cones, which mature mid- to late-season, with a broad harvest window. This helps to ensure excellent physical and chemical quality in the final product. Ella™ contributes hoppy and floral notes, with subtle hints of aniseed. It is 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	Australian breeding line
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 %	Terpenesters & -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.

ELLA™

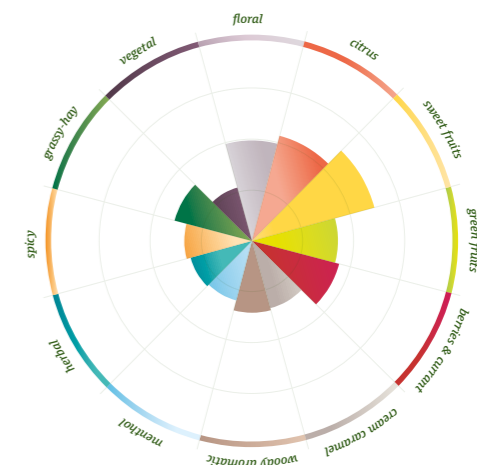
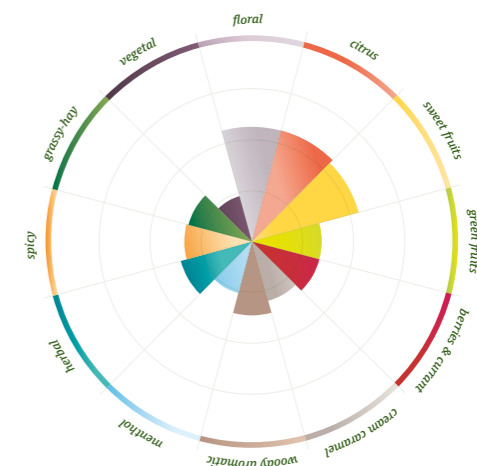
HARVEST 2021

Ella™ awaits with surprising fresh notes of passion fruit, lime and bergamot. Yet her typical character still shines through, enticing with lavender and resinous pine.

TYPICAL AROMA PROFILE

The distinctly floral aromas of this variety are unrivalled. Apart from that, its aroma ranges from sweet peach aromas to woody lavender and passion fruit. Distinct overtones of grapefruit and lime complete the overall picture.

Average Key Flavors since 2018



AUSTRALIA

Enigma™

Harvest 2021



Key Flavors 2021

- Passion Fruit
- Red Currant
- Blackberry
- Geranium
- Pear

Enigma™ was bred from Tett nang Tett nanger in the HPA breeding program and released in 2013.

ANALYSIS VALUES

Growing Area	Australia
Heritage	Heritage of Tett nanger
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 %	Terpenesters & -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.

ENIGMA™

HARVEST 2021

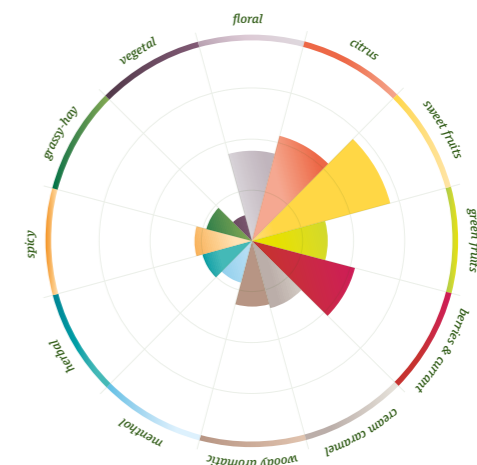
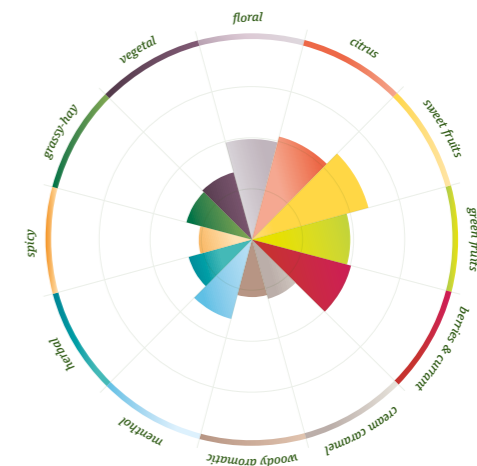
This mystery turned out to be easily decoded. Red berries dominate, enriched by exotic passion fruit and pear. A breeze of freshness is offered by a touch of camphor.

TYPICAL AROMA PROFILE

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

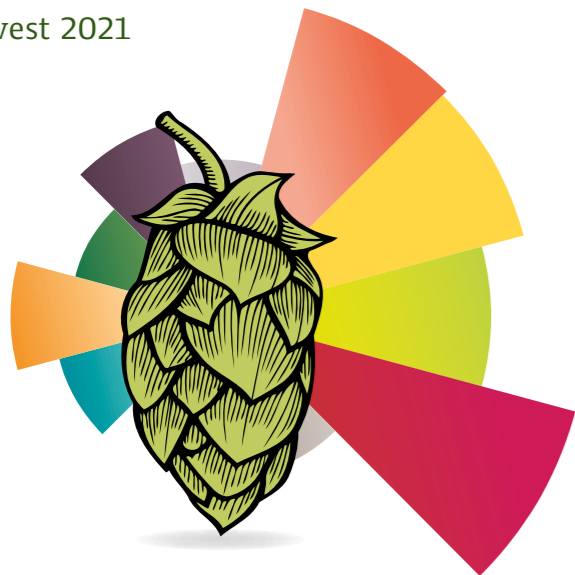
Average Key Flavors since 2018

- Passion Fruit
- Pineapple
- Blackberry
- Red Currant
- Lime



Galaxy™

Harvest 2021



Key Flavors 2021



The Australian hop variety Galaxy™ is a high alpha, dual purpose seedless cultivar with a marked and unique hop aroma, bred by Hop Products Australia and released in 2009. It is grown in Victoria and Tasmania.

ANALYSIS VALUES

Growing Area	Australia
Heritage	25 % Perle + Australian breeding line
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 %	Terpenesters & -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.

GALAXY™

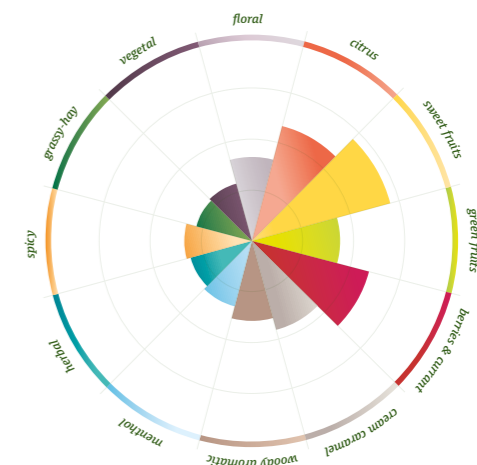
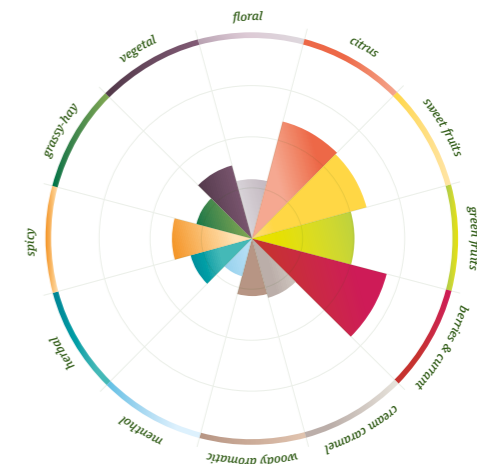
HARVEST 2021

Galaxy™ transports you far off into distant galaxies. As a glass of blackcurrant juice refreshes us, while dreaming of stars, grapefruit and celery return us to hoppy earth. This experience of flavor is completed with sweet notes of pineapple and gooseberry.

TYPICAL AROMA PROFILE

Galaxy™ contributes prominent citrus, passion fruit and peach aromas. Its aroma is defined by spicy components, such as aniseed and fennel, in a fruity combination with cassis, blueberry, blackberry and raspberry. In addition, notes of gooseberry can also be detected.

Average Key Flavors since 2018



AUSTRALIA

Topaz™

Harvest 2021



Key Flavors 2021

Grapefruit

Pomelo

Black Currant

Cream

Green Tea

Topaz™ was originally bred as a high alpha variety for hop extract production. It wasn't until later that its fruity aroma potential was discovered.

ANALYSIS VALUES

Growing Area	Australia
Heritage	Australian breeding line
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 %	Terpenesters & -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.

TOPAZ™

HARVEST 2021

Topaz™ could simply be described as citrusy relaxation. Grapefruit aroma meets green tea with a touch of cream. A hint of blackcurrant completes the experience.

TYPICAL AROMA PROFILE

This aroma variety combines the characteristic earthy notes of traditional English varieties with fruit aromas of blackberry, gooseberry, blueberry, black currant and passion fruit, rounded off with resinous and grapefruit notes.

Average Key Flavors since 2018

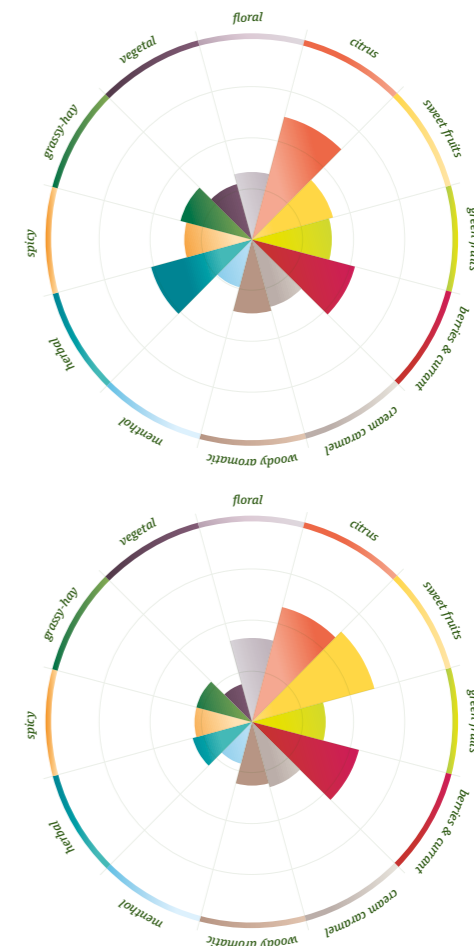
Grapefruit

Passion Fruit

Blackberry

Resin

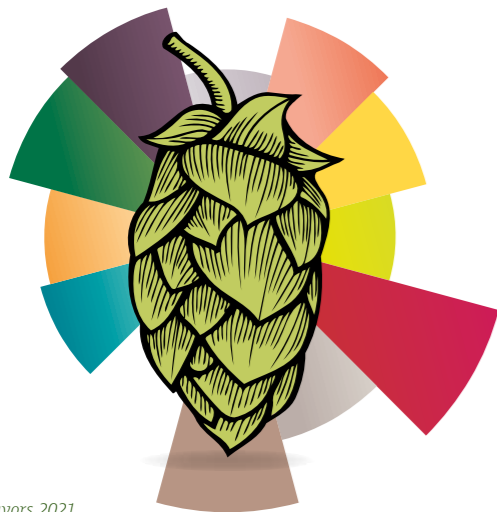
Black Currant



AUSTRALIA

Vic Secret™

Harvest 2021



Key Flavors 2021

- Ginger
- Tobacco
- Black Currant
- Tomato Leaves
- Carrot

The story of Vic Secret™ begins in the year 2000 when the first seedlings entered the HPA selection program. It was released in 2010 but not produced in commercial volumes until 2013. For a long time, it was a variety that only a few brewers knew.

ANALYSIS VALUES

Growing Area	Australia
Heritage	Cross between an Australian high alpha variety and a male cultivar from the UK
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

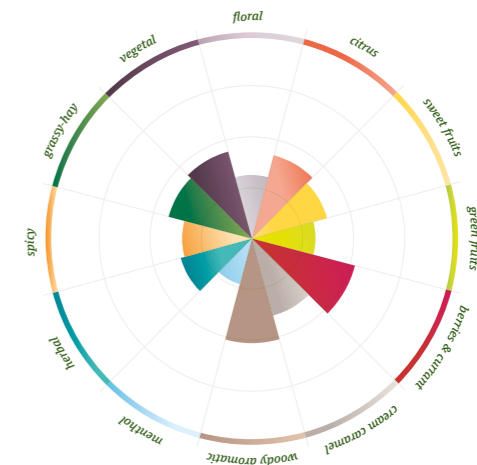
Myrcene	52.9 - 52.9 %	Geraniol	0.1 - 0.2 %
Linalool	0.4 - 0.7 %	Terpenesters & -alcohols	0.8 - 1.0 %
Humulene	9.4 - 12.2 %	Ketones	4.0 - 5.0 %
Caryophyllene	8.8 - 10.7 %	Isobutyrate	3.0 - 4.0 %
Farnesene	0.0 - 1.0 %	Thiols (µg/kg)	20.0 - 26.0

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

VIC SECRET™

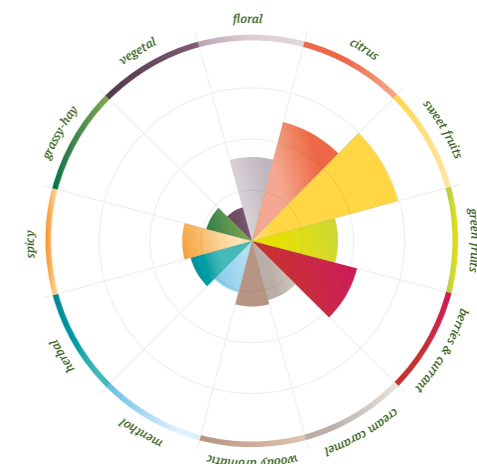
HARVEST 2021

A mystic mix of intense green notes, complemented by fresh ginger, sweet carrots and cassis. Vic Secret™ remains as secret as ever.



TYPICAL AROMA PROFILE

This variety is characterized by many different fruit aromas such as passion fruit, pineapple, gooseberries, raspberries and strawberries. Grapefruit and bergamot add a certain freshness to the mix.



Average Key Flavors since 2018

- Bergamot
- Passion Fruit
- Pineapple
- Raspberry
- Gooseberry





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Publishing Details

*Hop Harvest Guide 2021
 Publisher: Familie Barth, Freiligrathstr. 7-9, 90482 Nuremberg, Germany
 January 2022*

Concept, design, graphic illustration: claudiusbähr+friends

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