HOPUNION LLC

Hop Variety Handbook

Hop Variety Handbook

Hopunion LLC

Yakima, Washington
USA

Foreword

Over the last few years, the craft brewing industry has emerged as the driving force for new innovation in beer styles worldwide. As the modern beer consumer continues to expand their flavor preferences and experiment with unique offerings, the craft brewing industry is on the forefront of this trend. Access to new styles of specialty malts and hops have given the brewer the tools to continue to develop and perfect a wide array of styles and premium quality beers.

At Hopunion, we are proud to support the craft brewer's continued success in meeting consumer needs. We will always treat craft brewing as the cornerstone of our business and provide these brewers with the widest selection of premium quality hops available from the finest growing regions in the world.

We hope that this hop variety book provides a valuable resource for the craft brewing industry going forward. We know that we can never include all the information to meet everyone's needs, so please feel free to contact our knowledgeable staff and let us know if we can assist you in any way.

To all, "Live to the fullest and brew to the fullest."

Don Bryant
President & CEO
Hopunion LLC

Domestic Varieties

Ahtanum™ Brand YCR 1 cv.
Amarillo® Brand VGXP01 cv.
Brewer's Gold
Cascade
Centennial
Chinook
Citra® Brand HBC 394 cv.
Cluster
Columbus
Crystal
Fuggle
Galena
Glacier
Golding
Hallertau
Horizon
Liberty
Magnum
Millennium
Mt. Hood
Mt. Rainier
Newport
Northern Brewer
Nugget
Palisade® Brand YCR 4 cv.
Perle
Saaz
Santiam
Simcoe® Brand YCR 14 cv.
Sorachi Ace
Sterling
Summit™
Tettnang
Vanguard
Warrior® Brand YCR 5 cv.
Willamette

Imported Varieties

Australian Pride of Ringwood
Czech Saaz
French Strisselspalt
German Brewer's Gold
German Hallertau Mittelfrüh
German Herkules
German Hersbrucker
German Magnum
German Merkur
German Northern Brewer
German Opal
German Perle
German Saphir
German Spalter Select
German Smaragd (Emerald)
German Spalt
German Taurus
German Tettnang
German Tradition
New Zealand Cascade
New Zealand Hallertau Aroma
New Zealand Motueka
New Zealand Nelson Sauvin
New Zealand Pacifica
New Zealand Pacific Gem
New Zealand Riwaka
Styrian Aurora
Styrian Bobek
Styrian Celeia
Styrian Golding
UK Admiral
UK Bramling Cross
UK Challenger
UK East Kent Golding
UK First Gold
UK Fuggle
UK Northdown
UK Phoenix
UK Pilgrim
UK Pioneer
UK Progress
UK Target
UK WGV

Organic Varieties

Domestic

Cascade
Centennial
Citra® Brand HBC 394 cv.
Palisade® Brand YCR 4 cv.
Simcoe® Brand YCR 14 cv.

Imported

German Smaragd (Emerald)
German Tettnang
German Tradition
New Zealand Hallertau Aroma
New Zealand Motueka
New Zealand Pacific Gem
New Zealand Riwaka

AHTANUM™

Brand YCR 1 cv.

Featured Growers:

Carpenter Ranches LLC

Pedigree	Open pollination. Developed by Select Botanicals.
Yield	1990 — 2190 kg./ha. or 1775 — 1950 lb./ac.
Disease / Pest Susceptibility	Tolerant to downy mildew
Brewing Usage	Aroma
Aroma	Floral, citrus
Alpha Acids	5.7 — 6.3%
Beta Acids	5.0 — 6.5%
Co-Humulone	30 — 35% of alpha acids
Storage Stability	Fair to Good
Total Oil	0.8 — 1.2 mls / 100g
Myrcene	50 — 55% of total oil
Humulene	16 — 20% of total oil
Caryophyllene	9 — 12% of total oil
Farnesene	<1% of total oil
General Trade Perception	Used for its aromatic properties and moderate bittering
Possible Substitutions	Amarillo®, Cascade
Typical Beer Styles	American Ales, Pale Ale, IPA, Lager
Additional Information	Its name is derived from the Ahtanum area near Yakima where the first hop farm was established in 1869 by Charles Carpenter.

AMARILLO®

Brand VGXP01 cv.

Featured Growers:

Virgil Gamache Farms

Pedigree	Privately grown and registered
Yield	1350 — 1800 kg./ha. or 1200 — 1600 lb./ac.
Disease / Pest Susceptibility	Fairly resistant to all diseases
Brewing Usage	Aroma
Aroma	Floral, tropical and citrus tones
Alpha Acids	8 — 11%
Beta Acids	6 — 7%
Co-Humulone	21 — 24% of alpha acids
Storage Stability	Good
Total Oil	1.5 — 1.9 mls/100g
Myrcene	68 — 70% of total oil
Humulene	9 — 11% of total oil
Caryophyllene	2 — 4% of total oil
Farnesene	2 — 4% of total oil
General Trade Perception	Viewed as a Cascade type
Possible Substitutions	Cascade, Centennial, Simcoe®
Typical Beer Styles	American Ales, IPA, Belgian-style IPA, Double IPA
Additional Information	Limited acreage

US BREWER'S GOLD

Pedigree	A sibling of Bullion
Brewing Usage	Bittering
Aroma	Blackcurrant, fruity, spicy
Alpha Acids	8.0 — 10.0%
Beta Acids	3.5 — 4.5%
Co-Humulone	40 — 48%
Total Oil	2.0 — 2.4 mls/100g
General Trade Perception	Mainly used as a bittering hop
Possible Substitutions	Chinook, Galena, Nugget
Typical Beer Styles	Ale, Pilsner, Lambic, Biere de Garde, Saison
Additional Information	Limited acreage in the US. Developed by Professor Salmon in 1934.

CASCADE

Pedigree	Open pollination of a Fuggle seedling, derived from Fuggle and Serebrianka
Brewing Usage	Aroma
Aroma	Medium intensity, floral, citrus and grapefruit
Alpha Acids	4.5 — 7.0%
Beta Acids	4.5 — 7.0%
Co-Humulone	33 — 40% of alpha acids
Total Oil	0.8 — 1.5 mls/100g
General Trade Perception	An aroma variety with well-balanced bittering potential. Good for dry hopping.
Possible Substitutions	Ahtanum™, Amarillo®, Centennial
Typical Beer Styles	US-style Ales, IPA, Porter & Barley wines, Witbier
Additional Information	1st commercial hop from the USDA-ARS breeding program. It was bred in 1956 and released in 1972.

CENTENNIAL

Featured Growers:

3D Farm

C & C Hop Farms, Inc.

Pedigree	Cross between Brewer's Gold and a USDA male
Yield	1700 — 2000 kg./ha. or 1500 — 1750 lb./ac.
Disease / Pest Susceptibility	Moderately resistant to downy mildew and *Verticillium* wilt
Brewing Usage	Dual purpose
Aroma	Medium intensity, floral and citrus tones
Alpha Acids	9.5 — 11.5%
Beta Acids	3.5 — 4.5%
Co-Humulone	28 — 30% of alpha acids
Storage Stability	60-65% alpha remaining after 6 months
Total Oil	1.5 — 2.5 mls/100g
Myrcene	45 — 60% of total oil
Humulene	10 — 18% of total oil
Caryophyllene	4 — 8% of total oil
Farnesene	<1% of total oil
General Trade Perception	Very balanced, sometimes called a "Super"
Possible Substitutions	Cascade, possibly Chinook or Columbus
Typical Beer Styles	All US-style Ales, IPA Has been used with wheat beers
Additional Information	Popular among craft brewers; bred in 1974 and released in 1990

CHINOOK

Featured Growers:

Carpenter Ranches LLC
Van Horn Farms

Pedigree	Cross between Petham Golding and a high alpha USDA male
Yield	2000 — 2400 kg./ha. or 1780 — 2230 lb./ac.
Disease / Pest Susceptibility	Moderately resistant to downy mildew. Not excessively sensitive to insects.
Brewing Usage	Dual purpose
Aroma	Medium intensity, spicy, piney and distinct with subtle tones of grapefruit
Alpha Acids	12.0 — 14.0%
Beta Acids	3.0 — 4.0%
Co-Humulone	29 — 34% of alpha acids
Storage Stability	65— 70% alpha remaining after 6 months
Total Oil	1.5 — 2.5 mls/100g
Myrcene	35 — 40% of total oil
Humulene	20 — 25% of total oil
Caryophyllene	9 — 11% of total oil
Farnesene	<1% of total oil
General Trade Perception	A high alpha hop with an acceptable aroma profile
Possible Substitutions	Nugget, Columbus, Northern Brewer
Typical Beer Styles	US-style Pale Ale, IPA, Stout, Porter, Lager
Additional Information	Increasingly popular among craft brewers; released in 1985

CITRA®

Brand HBC 394 cv.

Featured Growers:

B.T. Loftus Ranches, Inc.
Carpenter Ranches LLC
Perrault Farms

Pedigree	Comprised of Hallertauer Mittlefrüh, US Tettnang, Brewer's Gold and East Kent Golding.
Yield	1600 — 1800 kg./ha. or 1200 — 1600 lbs./ac.
Brewing Usage	Aroma
Aroma	Strong citrus and tropical tones—grapefruit, melon, lime, gooseberry, passion fruit and lychee
Alpha Acids	11.0 — 13.0%
Beta Acids	3.5 — 4.5%
Co-Humulone	22 — 24% of alpha acids
Storage Stability	75% alpha remaining after 6 months
Total Oil	2.2 — 2.8 mls/100g
Myrcene	60 — 65% of total oil
Humulene	11 — 13% of total oil
Caryophyllene	6 — 8% of total oil
Farnese	<1% of total oil
General Trade Perception	New, up and coming variety, known for its intense flavor and aroma characteristics
Possible Substitutions	Unknown
Typical Beer Styles	American-style Pale Ale, IPA, Double IPA
Additional Information	Developed by the Hop Breeding Company of Yakima, Washington; released in 2007

CLUSTER

Pedigree	Unknown—suggested that it arose from hybridization of imported varieties and indigenous male hops
Brewing Usage	Dual purpose
Aroma	Strong, floral and spicy
Alpha Acids	5.5 — 8.5%
Beta Acids	4.5 — 5.5%
Co-Humulone	36 — 42% of alpha acids
Total Oil	0.4 — 0.8 mls/100g
General Trade Perception	Excellent general purpose hop with balanced bittering and aroma potential
Possible Substitutions	Galena
Typical Beer Styles	Ales (Aroma), Lagers (Bittering) and Stout; often used in reproductions of historical US beer styles
Additional Information	The oldest hop variety grown in the US

COLUMBUS

Pedigree	Bred and selected from Hopunion breeding
Brewing Usage	Dual purpose
Aroma	Pungent
Alpha Acids	14.0 — 16.0%
Beta Acids	4.0 — 5.0%
Co-Humulone	30 — 35% of alpha acids
Total Oil	1.5 — 2.0 mls/100g
General Trade Perception	Popular oil profile, great for dry hopping
Possible Substitutions	Chinook, Galena, Millennium and Nugget
Typical Beer Styles	US IPA, US Pale Ale, Stout, Barley Wine, Lager
Additional Information	Part of “CTZ” with Tomahawk® and Zeus

CRYSTAL

Featured Growers:

Sodbuster Farms, Inc.

Pedigree	Triploid variety from German Hallertau with contributions from Cascade, Brewer’s Gold and Early Green; a half-sister of Mt. Hood and Liberty.
Brewing Usage	Aroma
Aroma	Mild, floral and spicy
Alpha Acids	3.5 — 5.5%
Beta Acids	4.5 — 6.7%
Co-Humulone	20 — 26% of alpha acids
Total Oil	0.8 — 2.1 mls/100g
General Trade Perception	The most pungent of the new triploid Hallertau family
Possible Substitutions	Mt. Hood, Hersbrucker, Strisselspalt, Liberty, Hallertau
Typical Beer Styles	Lager, Kölsch, ESB, Pilsner, IPA, Pale Ale & Belgian Ales
Additional Information	Primarily grown in Oregon; released in 1993

US FUGGLE

Featured Growers:

Annen Bros., Inc.

Pedigree	A chance seedling
Brewing Usage	Aroma
Aroma	Mild, woody and fruity
Alpha Acids	4.0 — 5.5%
Beta Acids	1.5 — 2.0%
Co-Humulone	25— 32% of alpha acids
Total Oil	0.7—1.2 mls/100g
General Trade Perception	Traditional English-type aroma hop
Possible Substitutions	UK Fuggle, Willamette, Styrian Golding
Typical Beer Styles	Any English-style beer, US Ale, Lambic
Additional Information	Selected in 1861 by Richard Fuggle. Known as Styrian Golding in Slovenia and UK Fuggle in England.

GALENA

Pedigree	Open pollination of Brewer's Gold
Brewing Usage	Dual purpose
Aroma	Citrus
Alpha Acids	12.0 — 14.0%
Beta Acids	7.0— 9.0%
Co-Humulone	37 — 42% of alpha acids
Total Oil	0.9 — 1.2 mls/100g
General Trade Perception	Excellent high alpha hop with balanced bittering and aroma characteristics
Possible Substitutions	Brewer's Gold, Columbus, Nugget
Typical Beer Styles	Most English-style and American-style Ales
Additional Information	Developed in the Idaho state breeding program in 1968; released in 1978

GLACIER

Pedigree	Offspring of Elsasser
Brewing Usage	Dual purpose
Aroma	Pleasant hop
Alpha Acids	average ~5.63%
Beta Acids	average ~7.6%
Co-Humulone	11 — 13% of alpha acids
Total Oil	0.7—1.6 mls/100g
General Trade Perception	Excellent variety with balanced bittering properties and a good aroma profile
Possible Substitutions	Fuggle, Styrian Golding, Willamette
Typical Beer Styles	Pale Ale, ESB, English-style Pale Ale, Porter, Stout
Additional Information	Released as a public variety in 2000 by Dr. Stephen Kenny of Washington State University. Chosen for its low co-humulone and good yield potential.

US GOLDING

Pedigree	East Kent Golding
Brewing Usage	Aroma
Aroma	Mild, delicate classic English-type
Alpha Acids	4.0 — 6.0%
Beta Acids	2.0 — 3.0%
Co-Humulone	20 — 25% of alpha acids
Total Oil	0.4 — 1.0 mls/100g
General Trade Perception	Popular among ale breweries in the US
Possible Substitutions	Fuggle, UK East Kent Golding, Styrian Golding
Typical Beer Styles	All English-style beers, especially Bitters and Pale Ales, Belgian-style Ales, Barley Wine
Additional Information	UK Golding clones have been introduced for growing in WA and OR. There are no longer any BC Golding hops grown.

US HALLERTAU

Featured Growers:
Annen Bros., Inc.

Pedigree	Traditional German variety, originally selected in the area of the same name
Brewing Usage	Aroma
Aroma	Very mild, slightly flowery and spicy
Alpha Acids	3.5 — 5.5%
Beta Acids	3.5 — 5.5%
Co-Humulone	18 — 25% of alpha acids
Total Oil	0.6 — 1.5 mls/100g
General Trade Perception	Traditional German aroma hop
Possible Substitutions	Liberty, German Hallertau, German Tradition
Typical Beer Styles	Lager, Pilsner, Bock, Wheat, Munich Helles
Additional Information	Limited acreage grown in the US

HORIZON

Pedigree	Half-sister of Nugget
Yield	2100 — 2300 kg./ha. Or 1900 — 2000 lb.ac.
Disease / Pest Susceptibility	Susceptible to downy mildew. Moderately resistant to Verticillium wilt.
Brewing Usage	Dual purpose
Aroma	Floral, spicy
Alpha Acids	11 — 13%
Beta Acids	6.5 — 8.5%
Co-Humulone	16 — 19% of alpha acids
Storage Stability	Average to good
Total Oil	1.5 — 2.0 mls/100g
Myrcene	55 — 65% of total oil
Humulene	11 — 13% of total oil
Caryophyllene	7.5 — 9.0% of total oil
Farnesene	2.5 — 3.5% of total oil
General Trade Perception	Medium alpha, good aroma, dual purpose hop. Low co-humulone results in clean tasting beer
Possible Substitutions	Magnum
Typical Beer Styles	All ales and lagers
Additional Information	Commercially grown in small quantities, gaining popularity in the craft brew industry; developed in Oregon, 1970

LIBERTY

Featured Growers:
Annen Bros., Inc.

Pedigree	Cross between tetraploid female hop cultivar Hallertau Mittlefruh and downy mildew resistant male. A half sister to Ultra, Mt. Hood and Crystal.
Brewing Usage	Aroma
Aroma	Mild, slightly spicy
Alpha Acids	3.0 — 5.0%
Beta Acids	3.0 — 4.0%
Co-Humulone	24 — 30% of alpha acids
Total Oil	0.6 — 1.8 mls/100g
General Trade Perception	Close similarities to imported German aroma varieties, especially Hallertau
Possible Substitutions	US or German Hallertau, German Tradition, Mt. Hood
Typical Beer Styles	Lager, Pilsner, Bock, Kölsch, Wheat
Additional Information	1 of 4 triploid Hallertau varieties released, most closely resembles the Hallertau cultivar

US MAGNUM

Pedigree	Bred at the Hop Research Institute in Hüll, a cross between Galena and a German male
Brewing Usage	Bittering
Aroma	No distinct aroma characteristics
Alpha Acids	10.0 — 14.0%
Beta Acids	4.5 — 7.0%
Co-Humulone	24 — 30% of alpha acids
Total Oil	1.9 — 3.0 mls/100g
General Trade Perception	Gaining acceptance as a clean bittering hop
Possible Substitutions	German Magnum, Horizon
Typical Beer Styles	All Ales and Lagers
Additional Information	Limited US acreage but widely grown in Germany

MILLENNIUM

Pedigree	Descendent of Nugget
Brewing Usage	Bittering
Aroma	Mild, herbal
Alpha Acids	14.5 — 16.5%
Beta Acids	4.3 — 5.3%
Co-Humulone	28 — 32% of alpha acids
Total Oil	1.8 — 2.2 mls/100g
General Trade Perception	High alpha, very similar to Columbus and Nugget
Possible Substitutions	Columbus, Nugget, Summit™
Typical Beer Styles	Ales, Stout, Barley Wine
Additional Information	Released by John I. Haas in 2000

MT. HOOD

Featured Growers:

Sodbuster Farms, Inc.

Pedigree	Triploid seedling of Gr. Hallertauer Mittelfrüh, half sister to Ultra, Liberty and Crystal
Brewing Usage	Aroma
Aroma	Mild, somewhat pungent
Alpha Acids	4.0 — 8.0%
Beta Acids	5.0 — 7.5%
Co-Humulone	22 — 27% of alpha acids
Total Oil	1.0 — 1.3 mls/100g
General Trade Perception	Aroma hop variety with similarities to the German Hallertau and Hersbrucker varieties.
Possible Substitutions	German Hallertau, German Hersbrucker
Typical Beer Styles	Lager, Pilsner, Bock, Alt, Munich Helles, Wheat
Additional Information	Released in the US in 1989

MT. RAINIER

Pedigree	Complex parentage including Hallertau, Galena, and Fuggle
Brewing Usage	Dual purpose
Aroma	Excellent floral/noble aromas, with citrus and licorice tones
Alpha Acids	5.0 — 8.1%
Beta Acids	5.0 — 7.0%
Co-Humulone	21 — 24% of alpha acids
Total Oil	0.2—0.5 mls/100g
General Trade Perception	Similar to Hallertau, but with more bittering strength
Possible Substitutions	Hallertauer, Fuggle
Typical Beer Styles	
Additional Information	**will only be grown through the 2010 season*

NEWPORT

Pedigree	Open pollination
Brewing Usage	Bittering
Aroma	Mild
Alpha Acids	13.5 — 17.0%
Beta Acids	7.2 — 9.1%
Co-Humulone	36 — 38% of alpha acids
Total Oil	1.6 — 3.4 mls/100g
General Trade Perception	Viewed as a high-bittering alpha hop
Possible Substitutions	Galena, Nugget, Fuggle, Magnum, Brewer's Gold
Typical Beer Styles	Ales, Stout, Barley Wine
Additional Information	Released in 2002

US NORTHERN BREWER

Pedigree	Canterbury Golding female and the male OB21
Brewing Usage	Dual purpose
Aroma	Medium intensity with Evergreen, wood & mint overtones
Alpha Acids	8.0— 10.0%
Beta Acids	3.0 — 5.0%
Co-Humulone	20 — 30% of alpha acids
Total Oil	1.5 — 2.0 mls/100g
General Trade Perception	A true dual purpose hop with good aroma
Possible Substitutions	German Northern Brewer, Chinook
Typical Beer Styles	All English-styles, esp. Porters, Ales, Kölsch, and Munich Helles
Additional Information	Bred in England, 1934; limited acreage in the US

NUGGET

Pedigree	Lineage includes Brewer's Gold, Early Green and Canterbury Golding
Brewing Usage	Bittering
Aroma	Mild, herbal and pleasant
Alpha Acids	12.0 — 14.5%
Beta Acids	4.0 — 6.0%
Co-Humulone	24 — 30% of alpha acids
Total Oil	1.7 — 2.3 mls/100g
General Trade Perception	A high alpha hop with a good aroma profile
Possible Substitutions	Galena, Magnum, Columbus
Typical Beer Styles	Ales, Stout, Barley Wine, Saison, Biere de Garde
Additional Information	2nd largest hop variety in Oregon

PALISADE®

Brand YCR 4 cv.

Featured Growers:

B.T. Loftus Ranches, Inc.
Sauve & Sons Farm
Van Horn Farms
Wm. Gasseling Ranches, Inc.

Pedigree	Tettnang parentage
Yield	2400 — 3400 kg./ha. or 2200 — 3000 lb./ac.
Disease / Pest Susceptibility	Low susceptibility to powdery mildew
Brewing Usage	Aroma
Aroma	Floral, fruity and earthy tones
Alpha Acids	5.5 — 9.5%
Beta Acids	6.0 — 8.0%
Co-Humulone	24 — 29%
Storage Stability	Good
Total Oil	1.4 — 1.6 mls/100g
Myrcene	9 — 10% of total oil
Humulene	19 — 22% of total oil
Caryophyllene	16 — 18% of total oil
Farnesene	<1% of total oil
General Trade Perception	Used for its aromatic properties and moderate bittering
Possible Substitutions	Willamette
Typical Beer Styles	English and American-style ales
Additional Information	Cultivar bred by Yakima Chief Ranches

US PERLE

Pedigree	Bred from English Northern Brewer
Brewing Usage	Aroma
Aroma	Slightly spicy with floral tones
Alpha Acids	7.0 — 9.5%
Beta Acids	4.0 — 5.0%
Co-Humulone	27 — 32% of alpha acids
Total Oil	0.7 — 0.9 mls/100g
General Trade Perception	Often used as a dual purpose hop
Possible Substitutions	German Perle, German & US Northern Brewer
Typical Beer Styles	Pale Ale, Porter, Stout, Lager, Weizen, Alt, Barley Wine, Kölsch
Additional Information	Bred at the Hop Research Center in Hüll, Germany; maintains excellent storage stability

US SAAZ

Pedigree	US equivalent of the longstanding Czech variety
Brewing Usage	Aroma
Aroma	Very mild, spicy and earthy
Alpha Acids	3.0 — 4.5%
Beta Acids	3.0 — 4.5%
Co-Humulone	24 — 28% of alpha acids
Total Oil	0.5 — 1.0 mls/100g
General Trade Perception	Available in small quantities
Possible Substitutions	Czech Saaz, Polish Lublin, Sterling
Typical Beer Styles	Pilsner, Lager, Wheat, Belgian-style Ales
Additional Information	High ambient temperatures can have an adverse effect on yields

SANTIAM

Featured Growers:

Sodbuster Farms, Inc.

Pedigree	Triploid aroma selection from a diploid Tettnang clone and a tetraploid Hallertauer
Yield	1600 — 2350 kg./ha. or 1400 — 2100 lb./ac.
Disease / Pest Susceptibility	Resistant to downy mildew
Brewing Usage	Aroma
Aroma	Slightly spicy with herbal and floral tones
Alpha Acids	5.0 — 7.0%
Beta Acids	6.0 — 8.5%
Co-Humulone	20 — 24% of alpha acids
Storage Stability	Average
Total Oil	1.3 — 1.7 mls/100g
Myrcene	27 — 36% of total oil
Humulene	23 — 26% of total oil
Caryophyllene	7 — 8% of total oil
Farnesene	13 — 16% of total oil
General Trade Perception	American aroma hop that contains noble hop characteristics
Possible Substitutions	German Spalt, German Spalter Select, German Tettnang,
Typical Beer Styles	Lager, Pilsner, Belgian Tripel, Kölsch, Bock, Munich Helles
Additional Information	Limited but stable acreage; released in 1997

SIMCOE®

Brand YCR 14 cv.

Featured Growers:

B.T. Loftus Ranches, Inc.
Carpenter Ranches LLC
Perrault Farms

Pedigree	Bittering and aroma type cultivar
Yield	2650 — 2880 kg./ha. or 2300 — 2500 lb./ac.
Disease / Pest Susceptibility	Moderate tolerance to powdery mildew
Brewing Usage	Dual purpose
Aroma	Very unique, pine-like aroma
Alpha Acids	12.0 — 14.0%
Beta Acids	4.0 — 5.0%
Co-Humulone	15 — 20% of alpha acids
Storage Stability	Good
Total Oil	2.0 — 2.5 mls/100g
Myrcene	60 — 65% of total oil
Humulene	10 — 15% of total oil
Caryophyllene	5 — 8% of total oil
Farnesene	<1% of total oil
General Trade Perception	Used for aromatic and bittering properties
Possible Substitutions	Summit™, Magnum
Typical Beer Styles	American-style ales, Pale Ale, IPA, Double IPA
Additional Information	Known as a bittering hop with good aroma characteristics; bred by Yakima Chief Ranches

SORACHI ACE

Pedigree	Cross between Brewer's Gold, Saazer—OP and Beikei No. 2 male
Brewing Usage	Aroma
Aroma	Unique, lemon and slight dill
Alpha Acids	10 — 16%
Beta Acids	6 — 7%
Co-Humulone	~23% of alpha acids
Total Oil	2.0—2.8 mls/100g
General Trade Perception	An extremely unique high alpha aroma variety with great bittering characteristics
Possible Substitutions	Unknown
Typical Beer Styles	Belgian Wit, IPA, Pale Ale, Belgian Saison
Additional Information	Seedling selection made in Japan

STERLING

Pedigree	Lineage includes Saaz, Cascade, Brewer's Gold, Early Green and German open-pollination
Brewing Usage	Aroma
Aroma	Herbal and spicy with a hint of floral and citrus
Alpha Acids	6.0 — 9.0%
Beta Acids	4.0 — 6.0%
Co-Humulone	22 — 28% of alpha acids
Total Oil	1.3 — 1.9 mls/100g
General Trade Perception	Finding favor as a Saaz replacement
Possible Substitutions	Czech Saaz
Typical Beer Styles	Pilsner, Lager and Belgian-style Ales
Additional Information	Limited but stable acreage; released in 1998

SUMMIT™

Pedigree	Cross pollination of Lexus and an unspecified male; derived from numerous plants including Zeus, Nugget and male USDA varieties
Brewing Usage	Aroma
Aroma	Distinct spiciness with earthy, onion, garlic and citrus characteristics
Alpha Acids	16.0 — 19.0%
Beta Acids	3.3 — 6.0%
Co-Humulone	26 — 33%
Total Oil	1.5 — 2.5 mls/100g
General Trade Perception	Great late addition hop
Possible Substitutions	Columbus, Warrior®, Millennium
Typical Beer Styles	IPA, Pale Ale, Imperial IPA
Additional Information	Bred by the American Dwarf Hop Association in the United States, released in 2003

US TETTNANG

Pedigree	A traditional German land-race variety
Brewing Usage	Aroma
Aroma	Slightly spicy
Alpha Acids	4.0 — 5.0%
Beta Acids	3.0 — 4.5%
Co-Humulone	20 — 25% of alpha acids
Total Oil	0.4 — 0.8 mls/100g
General Trade Perception	A true noble aroma variety
Possible Substitutions	Fuggle, German Spalt, German Spalt Select, Santiam
Typical Beer Styles	Pilsner, Lager, Wheat, American-style Ales
Additional Information	Similar to Fuggle; popular with craft brewers

VANGUARD

Pedigree	Cross between USDA accessions 21285 (a Hallertau Mittelfrüh daughter) and 64037M
Brewing Usage	Aroma
Aroma	Similar to Hallertau Mittelfrüh
Alpha Acids	5.0 — 6.0%
Beta Acids	5.0 — 7.0%
Co-Humulone	14 — 16% of alpha acids
Total Oil	0.8 — 1.2 mls/100g
General Trade Perception	Used for its aromatic properties and low co-humulone
Possible Substitutions	Hallertau, German Hersbrucker, Mt Hood, Liberty
Typical Beer Styles	Lager, Pilsner, Bock, Kölsch, Wheat, Munich Helles, Belgian-style Ales
Additional Information	Similar to Hallertau Mittlefruh; released for cultivation in 1997

WARRIOR®

Brand YCR 5 cv.

Pedigree	Bred by Yakima Chief Ranches
Brewing Usage	Bittering
Aroma	Very mild
Alpha Acids	15.0 — 17.0%
Beta Acids	4.5 — 5.5%
Co-Humulone	24 — 26% of alpha acids
Total Oil	1.0 — 2.0 mls/100g
General Trade Perception	Stable, high alpha hop
Possible Substitutions	Columbus, Nugget, Magnum, Summit™
Typical Beer Styles	Pale Ale, IPA
Additional Information	Very grower friendly

WILLAMETTE

Pedigree	Triploid seedling of the English Fuggle variety
Brewing Usage	Aroma
Aroma	Mild and pleasant, slightly spicy
Alpha Acids	4.0 — 6.0%
Beta Acids	3.0 — 4.5%
Co-Humulone	30 — 35% of alpha acids
Total Oil	1.0—1.5 mls/100g
General Trade Perception	A quality hop aroma
Possible Substitutions	Glacier, US Fuggle, US Tettnang, Styrian Golding
Typical Beer Styles	All English-style Ales, US Pale Ale, US Brown Ale, American Lager
Additional Information	Well established in the US industry; currently the most widely grown aroma hop in the US

AUSTRALIAN PRIDE OF RINGWOOD

Pedigree	2nd generation from the English Pride of Kent
Brewing Usage	Bittering
Aroma	Pronounced and pleasant
Alpha Acids	7.0 — 11.0%
Beta Acids	4.0 — 6.0%
Co-Humulone	32 — 39% of alpha acids
Total Oil	0.9 — 2.0 ml/100g
General Trade Perception	Predominantly used as a bittering hop but contains interesting aromatic qualities
Possible Substitutions	Cluster, Galena
Typical Beer Styles	Australian lagers
Additional Information	Bred in Australia and grown since the 1960s

CZECH SAAZ

Pedigree	Czech aroma landrace variety
Brewing Usage	Aroma
Aroma	Very mild with pleasant hoppy notes
Alpha Acids	2.0 — 5.0%
Beta Acids	7.0 — 8.0%
Co-Humulone	23 — 28% of alpha acids
Total Oil	0.4 — 1.0 mls/100g
General Trade Perception	The classical “noble” aroma hop with long and strong traditions. Associated with the renowned Pilsner lager.
Possible Substitutions	Polish Lublin, US Saaz, US Sterling
Typical Beer Styles	Pilsner, Lagers, Belgian-Style Ales, Lambic
Additional Information	The predominant Czech variety

FRENCH STRISSELSPALT

Pedigree	Major aroma hop of the Alsace area of France near Strasbourg
Brewing Usage	Aroma
Aroma	Medium intensity, pleasant and hoppy
Alpha Acids	3.0 — 5.0%
Beta Acids	3.0 — 5.5%
Co-Humulone	20 — 25% of alpha acids
Total Oil	0.6— 0.9 mls/100g
General Trade Perception	Very good aroma hop
Possible Substitutions	Mt. Hood, Crystal, Hersbrucker
Typical Beer Styles	Pilsner, Lager, Wheat, Belgian-style Ales, Saison and Biere de Garde
Additional Information	Worldwide acceptance as a good aroma hop. Similar to Hersbrucker, but preferred by some breweries.

GERMAN BREWER'S GOLD

Pedigree	Open pollination of a wild Manitoba hop
Brewing Usage	Bittering
Aroma	Black currant, fruity, spicy
Alpha Acids	5.0 — 9.0%
Beta Acids	2.5 — 3.5%
Co-Humulone	40 — 48%
Total Oil	1.8 — 2.2 mls/100g
General Trade Perception	Mainly used as a bittering hop
Possible Substitutions	Galena, Northern Brewer, US Brewer's Gold, UK Northdown,
Typical Beer Styles	Ales, German Lagers, Lambic, Saison, Biere de Garde
Additional Information	Originally bred in the UK by professor E.S. Salmon; released in 1934

GERMAN HALLERTAU MITTELFRÜH

Pedigree	Traditional local variety in the Hallertau region
Brewing Usage	Aroma
Aroma	Mild with distinct floral, hop and citrus tones
Alpha Acids	3.0 — 5.5%
Beta Acids	3.0 — 5.0%
Co-Humulone	18 — 28% of alpha acids
Total Oil	0.7 — 1.3 mls/100g
General Trade Perception	The classic German aroma hop associated with Bavarian-style lager beers, distinguished by an intense, pleasantly harmonic bitterness.
Possible Substitutions	German Tradition, Liberty, Vanguard
Typical Beer Styles	Lager, Pilsner, Weizen, Belgian-style Ales, Alt, Lambic, Kölsch, Munich Helles
Additional Information	At one time, the major Hallertau landrace variety with a highly acclaimed aroma profile

GERMAN HERKULES

Pedigree	Cross between Hallertauer Taurus and a powdery mildew resistant Hüll male breeding line
Brewing Usage	Bittering
Aroma	Medium intensity, evenly distributed impressions
Alpha Acids	12.0 — 17.0%
Beta Acids	4.0 —5.5%
Co-Humulone	32 — 38% of alpha acids
Total Oil	1.6 — 2.4 mls/100g
General Trade Perception	Very high bitter value
Possible Substitutions	High alpha hop varieties
Typical Beer Styles	Pilsners, German-style Lagers, Alt
Additional Information	Bred at the Hop Research Center in Hüll, Germany; released in 2005

GERMAN HERSBRUCKER

Pedigree	Traditional German landrace variety selected in the Hersbruck area
Brewing Usage	Aroma
Aroma	Mild to medium, pleasant, floral and slightly fruity
Alpha Acids	2.0 — 5.0%
Beta Acids	2.5 — 6.0%
Co-Humulone	18 — 25% of alpha acids
Total Oil	0.7 — 1.3 mls/100g
General Trade Perception	A noble aroma type
Possible Substitutions	French Strisselspalt, Mt. Hood
Typical Beer Styles	Lager, Pilsner, Bock, Weizen Bock, Wheat, Belgian Ales, Kölsch, Munich Helles
Additional Information	Has developed into the variety with the largest acreage — grown throughout the Hallertau, Spalt and Hersbruck areas

GERMAN MAGNUM

Pedigree	Bred at the Hop Research Institute in Hüll
Brewing Usage	Bittering
Aroma	Delicate floral and fruity impressions
Alpha Acids	11.0 — 16.0%
Beta Acids	5.0 — 7.0%
Co-Humulone	21 — 29% of alpha acids
Total Oil	1.6 — 2.6 mls/100g
General Trade Perception	High alpha with good yields and disease resistance
Possible Substitutions	Columbus, Nugget, US Magnum
Typical Beer Styles	Ale, Lager, Stout, Pilsner types
Additional Information	The main high alpha variety grown in Germany

GERMAN MERKUR

Pedigree	Cross between Hallertauer Magnum and 81/8/13
Brewing Usage	Bittering
Aroma	Strong with earthy, floral and spicy tones
Alpha Acids	12.0 — 15.0%
Beta Acids	3.5 — 7.0%
Co-Humulone	16 — 20% of alpha acids
Total Oil	2.2 — 2.8 mls/100g
General Trade Perception	High alpha variety with high bitter value, good aroma, strong storage stability and low co-humulone
Possible Substitutions	German Magnum, German Taurus, German Tradition
Typical Beer Styles	German and American Lagers
Additional Information	Strong resistance to powdery mildew

GERMAN NORTHERN BREWER

Pedigree	One of the original high alpha hops bred in England; a cross between an American wild hop and English male
Brewing Usage	Dual purpose
Aroma	Medium intensity, hoppy tang
Alpha Acids	7 — 10%
Beta Acids	3.5 — 5%
Co-Humulone	27 — 33% of alpha acids
Total Oil	1.6 — 2.1 mls/100g
General Trade Perception	A true dual purpose hop
Possible Substitutions	Columbus, Chinook, Galena, Magnum, US Northern Brewer, German Brewer's Gold
Typical Beer Styles	ESB, Bitter, English Pale Ale, Porter, Lager,
Additional Information	Bred in England and later grown in Belgium, Spain, Germany and the US

GERMAN OPAL

Pedigree	Bred at the Hop Research Center in Hüll, Germany
Brewing Usage	Aroma
Aroma	Balanced fruity, hoppy, flowery, citrusy and herbal characteristics
Alpha Acids	5.0 — 8.0%
Beta Acids	3.5 — 5.5%
Co-Humulone	13.0 — 17.0% of alpha acids
Total Oil	0.8 — 1.3 ml/100g
General Trade Perception	Good aroma type
Possible Substitutions	Styrian Golding, East Kent Golding, Tettnang
Typical Beer Styles	Summer Ales, Light Ales, Belgian-style Ales, Wheat
Additional Information	Registered in 2001

GERMAN PERLE

Pedigree	Bred at the Hüll Hop Research Institute from the English Northern Brewer variety
Brewing Usage	Aroma
Aroma	Delicate, floral and fruity
Alpha Acids	6.0 — 10.0%
Beta Acids	2.5 — 5.0%
Co-Humulone	28 — 32% of alpha acids
Total Oil	0.8 — 1.3 mls/100g
General Trade Perception	Highly acceptable aroma variety with balanced bittering
Possible Substitutions	US Perle, Northern Brewer
Typical Beer Styles	Pale Ale, Porter, Stout, Lager, Pilsner, Weizen, Ale, Alt, Kölsch, Munich Helles
Additional Information	The most popular German-grown hop variety; released in 1978

GERMAN SAPHIR

Pedigree	Bred at the Hop Research Center in Hüll, Germany
Brewing Usage	Aroma
Aroma	Distinct aroma with flowery and fruity tones
Alpha Acids	2.0 — 4.5%
Beta Acids	4.0 — 7.0%
Co-Humulone	12 — 17% of alpha acids
Total Oil	0.8 — 1.4 mls/100g
General Trade Perception	Fine aroma variety
Possible Substitutions	Hallertau Mittelfrüh
Typical Beer Styles	German lagers, Pilsners, Belgian-style Ales
Additional Information	Released in 2002

GERMAN SPALTER SELECT

Pedigree	Bred from Hallertauer Mittlefrüh and Spalt as a disease resistant Spalt type.
Brewing Usage	Aroma
Aroma	Very fine Spalter type aroma with fruity and flowery tones, imparts a distinct hoppy tang
Alpha Acids	3.0 — 6.5%
Beta Acids	2.5 — 5.0%
Co-Humulone	21 — 27% of alpha acids
Total Oil	0.6 — 0.9 mls/100g
General Trade Perception	Bred to be like the Spalt/Tettnang/Saaz group
Possible Substitutions	US Saaz, US Tettnang, German Spalt, German Tettnang, German Hersbrucker
Typical Beer Styles	Lager, Alt, Kölsch
Additional Information	Bred at the Hop Research Center in Hüll, Germany; released in 1991

GERMAN SMARAGD
(EMERALD)

Pedigree	Bred at the Hop Research Center in Hüll, Germany
Brewing Usage	Aroma
Aroma	Predominantly fruity with hoppy and flowery tones
Alpha Acids	4.0 — 6.0%
Beta Acids	3.5 — 5.5%
Co-Humulone	13 — 18% of alpha acids
Total Oil	0.7 — 1.7 mls/100g
General Trade Perception	A fine aroma variety with high bitter value
Possible Substitutions	Unknown
Typical Beer Styles	Ales, Alt, Kölsch

GERMAN SPALT

Pedigree	Traditional German landrace variety selected and grown in the area of the same name
Brewing Usage	Aroma
Aroma	Mild and pleasant with flowery, fruity and spicy tones
Alpha Acids	2.5 — 5.5%
Beta Acids	3.0 — 5.0%
Co-Humulone	22 — 29% of alpha acids
Total Oil	0.5 — 0.9 mls/100g
General Trade Perception	Traditional noble aroma hop with average bitter value and very good aroma, provides a distinct hoppy flavor
Possible Substitutions	US Saaz, US Tettnang, German Spalter Select
Typical Beer Styles	Lager, Pilsner, Bock , Alt, Kölsch, Munich Helles
Additional Information	Only grown in the Spalt area, limited acreage

GERMAN TETTNANG

Pedigree	Traditional German landrace variety
Brewing Usage	Aroma
Aroma	Mild and pleasant with balanced aroma impressions
Alpha Acids	3.0 — 6.0%
Beta Acids	3.0 — 5.0%
Co-Humulone	22 — 29% of alpha acids
Total Oil	0.5 — 0.9 mls/100g
General Trade Perception	Traditional, noble aroma hop
Possible Substitutions	German Spalt, German Select, US Saaz, German Hersbrucker
Typical Beer Styles	Lager, Ale, Pilsner, Weizen, Lambic, Alt, Kölsch, Munich Helles, Belgian-style Ales
Additional Information	Largely confined to the Tettnang area and belonging to the Saaz variety group

GERMAN TAURUS

Pedigree	Cross between 82/39/37 and 85/54/15M
Brewing Usage	Bittering
Aroma	Strong
Alpha Acids	12.0 — 17.0%
Beta Acids	4.0 — 6.0%
Co-Humulone	20 — 25% of alpha acids
Total Oil	0.9 — 1.4 mls/100g
General Trade Perception	Ultra high-alpha variety of Hallertau, granting strong bitterness
Possible Substitutions	Magnum, Citra®, German Tradition
Typical Beer Styles	German-style Ales, Lagers
Additional Information	Bred at the Hop Research Institute in Hüll, Germany

GERMAN TRADITION

Pedigree	A cross between Hallertauer Gold and 75/15/106M originating in Germany
Brewing Usage	Aroma
Aroma	Medium intensity, floral and herbal tones
Alpha Acids	5 — 7%
Beta Acids	4 — 5%
Co-Humulone	26 — 29% of alpha acids
Total Oil	1.0 — 1.4 mls/100g
Possible Substitutions	Liberty, German Hallertau
Typical Beer Styles	Lager, Pilsner, Bock, Wheat, Weizen
Additional Information	Bred for disease resistance at the Hop Research Institute in Hüll Germany; registered in 1993

NEW ZEALAND CASCADE

Pedigree	Cross between English Fuggle and a male believed to have been a cross of Fuggle and Serebrianka
Brewing Usage	Aroma
Aroma	Citrus, grapefruit
Alpha Acids	6.0 — 8.0%
Beta Acids	5.0 — 5.5%
Co-Humulone	~37.0% of alpha acids
Total Oil	~1.1 mls/100 g
General Trade Perception	Performs well when used as a single variety across multiple kettle additions.
Possible Substitutions	US Cascade
Typical Beer Styles	“New World” style Pale Ales, Summer Ales, IPA
Additional Information	Released in 1972

NEW ZEALAND MOTUEKA

Pedigree	Bred by crossing a New Zealand breeding selection with Saazer parentage
Brewing Usage	Aroma
Aroma	Lemon, lime, tropical fruit
Alpha Acids	6.5 — 7.5%
Beta Acids	5.0 — 5.5%
Co-Humulone	~29.0% of alpha acids
Total Oil	~0.8 ml/100grams
General Trade Perception	Excellent in many applications and when employed in multiple additions from a single hop bill
Possible Substitutions	Saaz, Sterling
Typical Beer Styles	European Lagers, Belgian and English Ales, Pilsner
Additional Information	This hop offers a unique aroma and flavor making it suitable for producing bigger more traditional style Lagers, especially Bohemian Pilsner.

NEW ZEALAND HALLERTAU AROMA

Pedigree	Triploid aroma type bred by open pollination of Hallertau Mittelfrüh and a NZ derived male
Brewing Usage	Dual purpose
Aroma	Distinct floral, slight citrus/lime
Alpha Acids	6.5 — 8.5%
Beta Acids	~8.5%
Co-Humulone	28 — 30% of alpha acids
Total Oil	~1.0 mls/100g
General Trade Perception	Less spicy than the Hallertau Mittelfrüh; able to retain its clean taste even in older beers
Possible Substitutions	German Hallertau, Hersbrucker, Tettnang, Perle
Typical Beer Styles	Lager, Pilsner, Bitter, Ales, Bock
Additional Information	Bred at the NZ Riwaka HortResearch Centre; released in 1988

NEW ZEALAND NELSON SAUVIN

Pedigree	A triploid variety bred from NZ “Smoothcone” and a selected NZ male
Brewing Usage	Dual purpose
Aroma	Distinctive white wine ‘fruitiness,’ gooseberry
Alpha Acids	12.0 — 13.0%
Beta Acids	6.0 — 8.0%
Co-Humulone	~24% of alpha acids
Total Oil	~1.1 mls/100g
General Trade Perception	Considered by some as ‘extreme,’ this hop is often used in specialty craft and seasonal beers
Possible Substitutions	Unknown
Typical Beer Styles	American Pale Ale, Lager
Additional Information	Developed at the New Zealand HortResearch Centre; released in 2000

NEW ZEALAND PACIFICA

Pedigree	A triploid aroma type bred through the open pollination of Hallertau Mittelfrüh
Brewing Usage	Aroma
Aroma	Clean floral, slight citrus
Alpha Acids	5.0 — 6.0%
Beta Acids	~6.0%
Co-Humulone	~25% of alpha acids
Total Oil	~1.0 mls/100 g
General Trade Perception	An exciting “finger print” replica bred from the famous Hallertau Mittlefrüh hop variety.
Possible Substitutions	Hallertau Mittlefrüh
Typical Beer Styles	Lager, Pale Ale, Bock, Porter, Stouts
Additional Information	Developed through the hop breeding program at the New Zealand HortResearch Centre; released in 1994

NEW ZEALAND PACIFIC GEM

Pedigree	Triploid alpha type bred from NZ “Smoothcone,” Californian Late Cluster and Fuggle
Brewing Usage	Bittering
Aroma	Delicate blackberry and floral oak
Alpha Acids	13.0 — 15.0%
Beta Acids	7.0 — 9.0%
Co-Humulone	37 — 40% of alpha acids
Total Oil	~1.2 mls/100g
General Trade Perception	High alpha hop with a pleasant aroma and a high bitterness level; typically a first hop addition
Possible Substitutions	Galena
Typical Beer Styles	European Lagers, Ales, Dry Stouts
Additional Information	Developed through the hop breeding program at the New Zealand HortResearch Centre; released in 1987

NEW ZEALAND RIWAKA

Pedigree	Triploid variety bred through the crossing of “Old Line” Saazer and specially developed New Zealand breeding selections
Brewing Usage	Aroma
Aroma	Strong grapefruit, citrus
Alpha Acids	4.5 — 6.5%
Beta Acids	4.0 — 5.0%
Co-Humulone	~36% of alpha acids
Total Oil	~1.5 mls/100 g
General Trade Perception	Suitable where traditional Saazer types would be employed. Riwaka imparts is own zeal when used as a late kettle addition.
Possible Substitutions	Saaz, Sterling
Typical Beer Styles	Pale Ale, Pilsner
Additional Information	Released by New Zealand HortResearch Centre in 1997

STYRIAN AURORA

Pedigree	Diploid cross between Northern Brewer and a TG seedling of unknown origin
Brewing Usage	Aroma
Aroma	Intense, pleasant and hoppy
Alpha Acids	7.0 — 9.5%
Beta Acids	2.7 — 4.4%
Co-Humulone	22 — 26% of alpha acids
Total Oil	0.9 — 1.6 mls/100g
General Trade Perception	Very suitable for extraction and for combination with other varieties in the brewing process
Possible Substitutions	Styrian Bobek, Styrian Golding
Typical Beer Styles	All ales and some lagers
Additional Information	Also known as “Super Styrian”

STYRIAN BOBEK

Pedigree	Derived from a Northern Brewer and Yugoslavian male TG
Brewing Usage	Aroma
Aroma	Intense and pleasant hop aroma
Alpha Acids	3.5 — 7.0%
Beta Acids	4.0 — 6.1%
Co-Humulone	27 — 31% of alpha acids
Total Oil	0.7 — 4.0 mls/100g
General Trade Perception	Similar to Fuggle type
Possible Substitutions	Styrian Golding, UK or US Fuggle, Willamette
Typical Beer Styles	English Style Ales, ESB, Lager, Pilsner & Belgian-style Ales
Additional Information	Seedling selected by Dr. Tone Wagner in Zalec, Yugoslavia in the mid-1970s

STYRIAN GOLDING

Pedigree	A traditional Slovenian hop variety belonging to the Fuggle ecotype
Brewing Usage	Aroma
Aroma	Delicate, slightly spicy
Alpha Acids	3.0 — 63.0%
Beta Acids	1.8 — 4.1%
Co-Humulone	27 — 33% of alpha acids
Total Oil	0.3 — 1.7 mls/100g
General Trade Perception	A world-renowned aroma hop with widespread usage in both ale and lager brewing.
Possible Substitutions	US Fuggle, UK Fuggle, Willamette, Styrian Bobek
Typical Beer Styles	English and Belgian-style Ales, Lagers, Pilsners
Additional Information	Known in Slovenia as the Savinja Golding, this variety is the same as the English Fuggle

STYRIAN CELEIA

Pedigree	Triploid hybrid between Styrian Golding, Aurora and a Slovenian wild hop
Brewing Usage	Aroma
Aroma	Pleasant, hoppy
Alpha Acids	3.0 — 6.0%
Beta Acids	2.0 — 3.3%
Co-Humulone	26 — 29% of alpha acids
Total Oil	0.6 — 3.6% of dry matter
General Trade Perception	A high quality aroma variety with excellent bitterness and aroma qualities
Possible Substitutions	Saaz, Styrian Golding, Styrian Bobek
Typical Beer Styles	English and Belgian-style Ales, Lager, Pilsner

UK ADMIRAL

Pedigree	Bred at Wye College
Brewing Usage	Bittering
Aroma	Pleasant, hoppy
Alpha Acids	13.5 — 16.2%
Beta Acids	4.8 — 6.0%
Co-Humulone	37 — 45% of alpha acids
Total Oil	1.0 — 1.7 mls/100g
General Trade Perception	Very good high alpha hop
Possible Substitutions	Target, Northdown, Challenger
Typical Beer Styles	Ales
Additional Information	Bred at HRI Wye to increase the range of UK high alpha varieties; released in 1998

UK BRAMLING CROSS

Pedigree	Bred from a cross between Bramling (a traditional Golding variety) and a Manitoban wild hop seedling
Brewing Usage	Aroma
Aroma	Strong spice and blackcurrant tones
Alpha Acids	5.0 — 7.0%
Beta Acids	2.3 — 3.2%
Co-Humulone	33 — 35% of alpha acids
Total Oil	0.7 — 1.0 mls/100g
General Trade Perception	Often used to produce specialty craft beers
Possible Substitutions	UK Kent Golding, UK Progress
Typical Beer Styles	All styles
Additional Information	Developed at Wye College by Professor Salmon

UK CHALLENGER

Pedigree	A granddaughter of Northern Brewer; lineage also includes Northdown
Brewing Usage	Dual purpose
Aroma	Mild to moderate, spicy
Alpha Acids	5.0 — 9.0%
Beta Acids	3.2 — 4.2%
Co-Humulone	20 — 25% of alpha acids
Total Oil	1.0 — 1.5 mls/100g
General Trade Perception	A dual purpose hop combining moderate alpha acid levels with a good kettle hop aroma
Possible Substitutions	US or German Perle, Northern Brewer
Typical Beer Styles	English-style Ale, Porter, Stout, ESB, Bitter, Barley Wine, Brown ales
Additional Information	Extremely versatile; widely used for both early and late kettle hoping

UK EAST KENT GOLDING

Pedigree	Developed by clonal selection from 1790 on, starting from Canterbury Whitebine
Brewing Usage	Aroma
Aroma	Smooth, delicate, slightly spicy
Alpha Acids	4.0 — 7.0%
Beta Acids	2.0 — 2.8%
Co-Humulone	28 — 32% of alpha acids
Total Oil	0.8—1.0 mls/100g
General Trade Perception	Classic English Ale hop which has been used in kettle and dry hopping
Possible Substitutions	US Golding, Whitbread Golding, UK Progress
Typical Beer Styles	All English style Ales, Belgian style Ales
Additional Information	First planted in the US in 1995

UK FIRST GOLD

Pedigree	Cross-pollination of the Whitbread Golding variety and a dwarf male
Brewing Usage	Dual purpose
Aroma	Similar to Golding, slightly spicy but smooth
Alpha Acids	6.5 — 8.5%
Beta Acids	3 — 4%
Co-Humulone	31 — 36% of alpha acids
Total Oil	0.7 — 1.5 mls/100g
General Trade Perception	Suitable as a general kettle hop and also for late and dry hopping in all types of beer
Possible Substitutions	Crystal, UK East Kent Golding
Typical Beer Styles	Ale, ESB
Additional Information	First commercial dwarf hop designed for aroma consideration in England

UK FUGGLE

Pedigree	A chance seedling raised in England
Brewing Usage	Aroma
Aroma	Mild, pleasant and hoppy
Alpha Acids	3.0 — 6.0%
Beta Acids	2.2 — 3.1%
Co-Humulone	30 — 33% of alpha acids
Total Oil	0.7 — 1.4 mls/100g
General Trade Perception	Long associated with English ale brewing.
Possible Substitutions	US Fuggle, Willamette, Styrian Golding
Typical Beer Styles	English and Belgian-style Ales, ESB, Bitter, Lager, Lambic
Additional Information	Once a predominant hop in England, now reserved for aroma use in conjunction with high alpha types.

UK NORTHDOWN

Pedigree	First generation selection from Northern Brewer and a downy resistant, German male
Brewing Usage	Dual purpose
Aroma	Mild, pleasant and delicate hop aroma
Alpha Acids	6.0 — 10.0%
Beta Acids	4.4 — 6.2%
Co-Humulone	24 — 29% of alpha acids
Total Oil	1.2 — 2.2 mls/100g
General Trade Perception	A true dual-purpose hop with moderate bittering potential and excellent flavor/aroma characteristics
Possible Substitutions	UK Challenger, Northern Brewer
Typical Beer Styles	All Ales, Porter
Additional Information	Released in the early 1970s with relatively high alpha acids; an “aunt” to UK Challenger and UK Target

UK PHOENIX

Pedigree	Seedling of the high alpha variety, Yeoman
Brewing Usage	Dual purpose
Aroma	Crisp and pleasant
Alpha Acids	8.0 — 12.0%
Beta Acids	4.2 — 5.5%
Co-Humulone	~30% of alpha acids
Total Oil	1.2 — 2.5 mls/100g
General Trade Perception	Has performed well as a replacement for high alpha or dual purpose hops early in the boil
Possible Substitutions	Challenger
Typical Beer Styles	Ales
Additional Information	Developed at Wye College

UK PILGRIM

Pedigree	Descendent of First Gold and Herald
Brewing Usage	Dual purpose
Aroma	Distinctly hoppy with pleasant lemon tones
Alpha Acids	9.0 — 13.0%
Beta Acids	4.3 — 5.0%
Co-Humulone	36 — 38% of alpha acids
Total Oil	1.2 — 2.4 ml/100g
General Trade Perception	Dual purpose hop
Possible Substitutions	Target, Challenger
Typical Beer Styles	Ales
Additional Information	Bred at the Horticultural Research Institute in Wye, England; released in 2000

UK PIONEER

Pedigree	Sister to English Herald, distant relative of Yeoman
Brewing Usage	Dual purpose
Aroma	Pleasant lemon and citrus tones
Alpha Acids	7.0 — 11.0%
Beta Acids	3.5 — 4.0%
Co-Humulone	~37% of alpha acids
Total Oil	0.8 — 1.8 mls/100g
General Trade Perception	Combines a pleasant aroma with a moderately high alpha acid content
Possible Substitutions	UK Kent Golding
Typical Beer Styles	Ales, ESB

UK TARGET

Pedigree	Second generation selection from Northern Brewer and a male, English Golding seedling
Brewing Usage	Bittering
Aroma	Pleasant but intense English hop aroma
Alpha Acids	8.0 — 13.0%
Beta Acids	4.5 — 5.7%
Co-Humulone	29 — 37% of alpha acids
Total Oil	1.6 — 2.6 mls/100g
General Trade Perception	A good high alpha variety with an acceptable kettle hop aroma
Possible Substitutions	Fuggle, Willamette
Typical Beer Styles	All Ales and Lagers
Additional Information	Predominant UK variety normally bred for bittering, but widely used for its high alpha content and aroma.

UK PROGRESS

Pedigree	Seedling of WGV crossed with O.B.79 (which is also the grandfather of Target)
Brewing Usage	Aroma
Aroma	Moderately strong, good aroma
Alpha Acids	4.0 — 7.0%
Beta Acids	2.0 — 2.8%
Co-Humulone	25 — 30% of alpha acids
Total Oil	0.6 — 1.2 mls/100g
General Trade Perception	A robust aroma hop with moderate bittering potential
Possible Substitutions	UK Kent Golding, Fuggle
Typical Beer Styles	Ale, Bitter, ESB, Porter
Additional Information	One of the few UK aroma hops purposefully bred in a modern breeding program

UK WGV

Pedigree	Open pollination of Bates Brewer
Brewing Usage	Aroma
Aroma	Moderate, sweet, pleasant and slightly fruity
Alpha Acids	5.0 — 8.0%
Beta Acids	2.0 — 2.7%
Co-Humulone	25 — 34% of alpha acids
Total Oil	0.8 — 1.2 mls/100g
General Trade Perception	Sometimes used as a distinctive dry hop
Possible Substitutions	UK Kent Golding, UK Progress
Typical Beer Styles	Pale Ale, Wheat
Additional Information	Bred in 1911

Organic Hops

In June 2007, the United States Department of Agriculture's National Organic Standards Board added hops to the National List of Approved and Prohibited Substances of non-organic ingredients allowed in organic food (section 205.606 of the federal organic regulations). This list creates a 5% allowance for non-organically produced agricultural ingredients to be used in, or on, processed "organic" products. The only caveat is that products must be listed as part of section 205.606 and determined by an accredited certifying agent to be commercially unavailable.

At the time of this ruling, organic hops were primarily produced in Europe and New Zealand. Since then however, the U.S. organic hop industry has made significant advances as growers in the Northwest and throughout the country have diligently worked to increase the commercial availability of organically produced hops. Today, more than thirty domestic varieties are being produced organically. As a result of this effort, hops will officially be removed from the USDA National Organic Program's National List of Approved and Prohibited Substances (section 205.606), effective January 1, 2013.

Although there are conveniences associated with the use of non-organic hops, Hopunion LLC proudly supports the growth and expansion of the organic hop industry. Like our pelletizing process, we know that procuring organic hops is more tedious and costly than conventional varieties, however we believe in the quality and principle of 100% organic beer.

Aside from increased costs, organic growing practices provide many benefits. Employing sustainable, organic agricultural techniques improves soil fertility, enhances biodiversity and reduces the negative impact of harmful chemicals and pesticides. Domestically produced organic hops also help decrease the carbon footprint created from buying organic European and New Zealand hops. Unbeknownst to many, non-organic hops also benefit from organic methods that are less disruptive and more sustainable.

As the organic hop industry expands, Hopunion is dedicated to meeting our customer's needs and promoting their success by sourcing a variety of the finest quality organic hops. We are continually increasing our selection and look forward to supporting brewers involved in organic brewing. In the end, we believe that everyone, growers, brewers and consumers alike, will all benefit from production of truly organic beer.

ORGANIC CASCADE

Pedigree	Open pollination of a Fuggle seedling, derived from Fuggle and Serebrianka
Brewing Usage	Aroma
Aroma	Medium intensity, floral, citrus and grapefruit
Alpha Acids	4.5 — 7.0%
Beta Acids	4.5 — 7.0%
Co-Humulone	33 — 40% of alpha acids
Total Oil	0.8 — 1.5 mls/100g
General Trade Perception	An aroma variety with well-balanced bittering potential. Good for dry hopping.
Possible Substitutions	Ahtanum™, Amarillo®, Centennial
Typical Beer Styles	American-style Ales, especially Pale Ale, IPA, Porter, and Barley wines
Additional Information	1st commercial hop from the USDA-ARS breeding program; bred in 1956 and released in 1972.

ORGANIC CENTENNIAL

Pedigree	Cross between Brewer's Gold and a USDA male
Brewing Usage	Dual purpose
Aroma	Medium intensity, floral and citrus tones
Alpha Acids	9.5 — 11.5%
Beta Acids	3.5 — 4.5%
Co-Humulone	28 — 30% of alpha acids
Total Oil	1.5 — 2.5 mls/100g
General Trade Perception	Very balanced, sometimes called a super
Possible Substitutions	Cascade, possibly Columbus or Chinook
Typical Beer Styles	American-style Ales, US wheat beers
Additional Information	Popular among craft brewers; bred in 1974 and released in 1990

ORGANIC CITRA®

Brand HBC 394 cv.

Pedigree	Comprised of Hallertauer Mittlefrüh, US Tettnang, Brewer's Gold and East Kent Golding.
Brewing Usage	Aroma
Aroma	Strong citrus and tropical tones of grapefruit, melon, lime, gooseberry, passion fruit and lychee
Alpha Acids	11.0 — 13.0%
Beta Acids	3.5 — 4.5%
Co-Humulone	22 — 24% of alpha acids
Total Oil	2.2 — 2.8 mls/100g
General Trade Perception	Known for its intense flavor and aroma characteristics
Possible Substitutions	Unknown
Typical Beer Styles	American-Style Pale Ale
Additional Information	Developed by the Hop Breeding Company and released in 2007

ORGANIC PALISADE®

Brand YCR 4 cv.

Pedigree	Tettnang parentage
Brewing Usage	Aroma
Aroma	Floral, fruity and earthy tones
Alpha Acids	5.5 — 9.5%
Beta Acids	6.0 — 8.0%
Co-Humulone	24 — 29%
Total Oil	1.4 — 1.6 mls/100g
General Trade Perception	Used for its aromatic properties and moderate bittering
Possible Substitutions	Willamette
Typical Beer Styles	English and American ales
Additional Information	Bred by Yakima Chief Ranches

ORGANIC SIMCOE®

Brand YCR 14 cv.

Pedigree	Bittering and aroma type cultivar
Brewing Usage	Dual purpose
Aroma	Very unique, pine-like aroma
Alpha Acids	12.0 — 14.0%
Beta Acids	4.0 — 5.0%
Co-Humulone	15 — 20% of alpha acids
Total Oil	2.0 — 2.5 mls/100g
General Trade Perception	Used for its aromatic and bittering properties
Possible Substitutions	Summit™, Magnum
Typical Beer Styles	American-style Ales
Additional Information	A bittering hop with good aroma characteristics; bred by Yakima Chief Ranches

ORGANIC GERMAN SMARAGD (EMERALD)

Pedigree	Developed at the Hop Research Center in Hüll, Germany
Brewing Usage	Aroma
Aroma	Very fine, natural hoppy and fruity tones
Alpha Acids	4.0 — 6.0%
Beta Acids	3.5 — 5.5%
Co-Humulone	13 — 18% of alpha acids
Total Oil	0.7 — 1.7 mls/100g
General Trade Perception	Fine aroma variety with high bitter value
Possible Substitutions	Unknown
Typical Beer Styles	Ales

ORGANIC GERMAN TETTNANG

Pedigree	Traditional German landrace variety
Brewing Usage	Aroma
Aroma	Mild and pleasant, slightly spicy
Alpha Acids	3.0 — 6.0%
Beta Acids	3.0 — 5.0%
Co-Humulone	22 — 29% of alpha acids
Total Oil	0.5 — 0.9 mls/100g
General Trade Perception	Traditional noble aroma hop
Possible Substitutions	German Spalt, German Select, US Tettnang, US Saaz, German Hersbrucker
Typical Beer Styles	Lager, Ale, Pilsner, Weizen, Lambic, Alt, Kölsch, Munich Helles
Additional Information	Largely confined to the Tettnang area and belonging to the Saaz variety group

ORGANIC GERMAN TRADITION

Pedigree	A cross between Hallertauer Gold and 75/15/106M originating in Germany
Brewing Usage	Aroma
Aroma	Very fine, similar to German Hallertau
Alpha Acids	5 — 7%
Beta Acids	4 — 5%
Co-Humulone	26 — 29% of alpha acids
Total Oil	1.0 — 1.4 mls/100g
Possible Substitutions	Liberty, German Hallertau
Typical Beer Styles	Lager, Pilsner, Bock, Wheat, Weizen
Additional Information	Bred for disease resistance at the Hop Research Institute in Hüll Germany; released in 1991

ORGANIC NZ HALLERTAU AROMA

Pedigree	Triploid aroma type bred by open pollination of Hallertau Mittelfrüh and a NZ derived male
Brewing Usage	Dual purpose
Aroma	Distinct floral, slight citrus/lime
Alpha Acids	8.0 — 10.0%
Beta Acids	~8.5%
Co-Humulone	28 — 30% of alpha acids
Total Oil	~1.0 mls/100g
General Trade Perception	Slightly less spicy than the Hallertau Mittelfrüh; able to retain its clean taste even in older beers
Possible Substitutions	Hallertau, Hersbrucker, Tettnang, Perle
Typical Beer Styles	Lagers, Pilsners, Bitters, Ales, Bocks
Additional Information	Bred at the NZ Hort Riwaka Research Centre; released in 1988

ORGANIC NZ MOTUEKA

Pedigree	Bred by crossing a New Zealand breeding selection with Saazer parentage
Brewing Usage	Aroma
Aroma	Lemon, lime, tropical fruit
Alpha Acids	7.0 — 8.0%
Beta Acids	5.0 — 5.5%
Co-Humulone	~29.0% of alpha acids
Total Oil	~0.8 ml/100grams
General Trade Perception	Excellent in many applications and when employed in multiple additions from a single hop bill
Possible Substitutions	Saaz
Typical Beer Styles	European Lagers, Belgian and English Ales, Pilsners
Additional Information	This hop offers a unique aroma and flavor making it suitable for producing bigger more traditional style Lagers, especially Bohemian Pilsner.

ORGANIC NZ PACIFIC GEM

Pedigree	Triploid alpha type bred from NZ “Smoothcone,” Californian Late Cluster and Fuggle
Brewing Usage	Bittering
Aroma	Delicate blackberry and floral oak
Alpha Acids	13.0 — 16.0%
Beta Acids	7.0 — 9.0%
Co-Humulone	37 — 40% of alpha acids
Total Oil	~1.2 mls/100g
General Trade Perception	High alpha hop with a pleasant aroma and a useful bitterness level; typically first hop addition
Possible Substitutions	Galena
Typical Beer Styles	European lagers, Ales, Dry Stouts, Ice Beers
Additional Information	Developed through the hop breeding program at the New Zealand HortResearch Centre; released in 1987

ORGANIC NZ RIWAKA

Pedigree	Triploid variety bred by crossing “Old Line” Saazer and specially developed New Zealand selections
Brewing Usage	Aroma
Aroma	Strong grapefruit, citrus
Alpha Acids	6.0 — 7.0%
Beta Acids	4.0 — 5.0%
Co-Humulone	~36% of alpha acids
Total Oil	~1.5 mls/100 g
General Trade Perception	Suitable where traditional Saaz types would be used; imparts is own zeal when used as a late addition.
Possible Substitutions	Saaz
Typical Beer Styles	Pale Ales, Pilsners
Additional Information	Released by New Zealand HortResearch Centre in 1997

Glossary

ALPHA ACIDS
Alpha acids are a major component of the soft resins. When isomerized, these materials provide the main bitter compounds associated with beer. The alpha acids content varies widely among hop varieties from levels of 3-4% w/w in aromatic type hops to levels of 13-14% w/w and higher in bitter hops.

BETA ACIDS
Beta acids, another soft resin component, are not bitter in their natural, or isomeric, form. Some of the oxidation products do provide bitterness, and the beta-acids can be chemically transformed into light-stable bittering forms.

CO-HUMULONE
Alpha acids exist in three analogous forms: humulone, ad-humulone and co-humulone. Proportions of these analogues vary markedly with variety. It is widely held that higher levels of co-humulone produce a harsh, unpleasant bitterness and have a negative impact on head retention.

LUPULIN
Lupulin varies from pale yellow to intense gold in color. It is not known if lupulin color affects brewing performance, but it is certain that bitter type hops have much greater quantities of lupulin than aromatic types.

MYRCENE, HUMULENE, CARYOPHYLLENE, AND FARNESENE
These essential oil components account for approximately 60-80% of a variety’s essential oil. Each compound is a highly volatile hydrocarbon. During the boiling of the wort, most of these compounds are driven off, contributing very little to flavor or aroma. Some of the oxidation products are thought to be positive contributors to beer flavors. Hence, sufficient aging of aromatic hop varieties is necessary to allow these products to be formed.

PEDIGREE
Pedigree refers to a variety’s ancestry. It is important to note that the qualities of a variety are only partially determined by the genes—of equal importance is the selection for particular characteristics practiced by the hop breeders.

TOTAL OIL
Hop oil content varies widely among seasons, varieties, and growths, from approximately 0.5 to 3 mls per 100 g of hops. While the soft resins are responsible for providing bitterness, the quantity and composition of the essential oils are responsible for the amount and quality of hop flavor and aroma in beer. A brewer, when deciding on which varieties and how much to use, will always consider the hops’ contribution to flavor and aroma as well as its bittering potential.

YIELD
Yield is the kiln dry weight of hops normally produced by that variety in commercial production in the United States. On average, aromatic types tend to be lower yielding, and hence more highly priced, than bitter types. As with other crops, yields vary by farm and season.