



# Hopunion CBS, LLC

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### US AHTANUM

<b>Pedigree</b>	Open pollination
<b>Maturity</b>	Medium-late
<b>Yield</b>	1990 – 2190 kg./ha. or 1775 – 1950 lb./ac.
<b>Growth Habit</b>	Good
<b>Disease/Pest Susceptibility</b>	Tolerant to downy mildew and Peronospora
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Small, compact cone
<b>Lupulin</b>	Fairly yellow, similar to Cascade
<b>Aroma</b>	Floral
<b>Alpha Acids</b>	5.7 – 6.3% w/w
<b>Beta Acids</b>	5 – 6.5% w/w
<b>Co-Humulone</b>	30 – 35% of alpha acids
<b>Storageability</b>	Fair to good
<b>Total Oil</b>	0.8 – 1.2 mls/100 grams
<b>Myrcene</b>	50 – 55% of whole oil
<b>Humulene</b>	16 – 20% of whole oil
<b>Caryophyllene</b>	9 – 12% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Used for its aromatic properties and moderate bittering.
<b>Possible Substitutions</b>	Cascade, Amarillo
<b>Typical Beer Styles</b>	Lager, American Ales
<b>Additional Information</b>	Quite similar to Cascade
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US AMARILLO

<b>Pedigree</b>	Privately grown and registered.
<b>Maturity</b>	Mid-season
<b>Yield</b>	Not determined yet
<b>Growth Habit</b>	Good
<b>Disease/Pest Susceptibility</b>	Fairly resistant to all diseases
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Small, tight cone
<b>Lupulin</b>	Plentiful
<b>Aroma</b>	Floral and citrusy
<b>Alpha Acids</b>	8 – 11% w/w
<b>Beta Acids</b>	6 – 7% w/w
<b>Co-Humulone</b>	21 – 24 of alpha acids
<b>Storageability</b>	Average
<b>Total Oil</b>	1.5 – 1.9 mls/100 grams
<b>Myrcene</b>	68 – 70% of whole oil
<b>Humulene</b>	9 – 11% of whole oil
<b>Caryophyllene</b>	2 – 4% of whole oil
<b>Farnesene</b>	2 – 4% of whole oil
<b>General Trade Perception</b>	Gaining acceptance, viewed somewhat as a Cascade type
<b>Possible Substitutions</b>	Cascade, Centennial, possibly Chinook or Ahtanum
<b>Typical Beer Styles</b>	American Ales, IPA
<b>Additional Information</b>	Very limited acreage at this time.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US BREWER'S GOLD

<b>Pedigree</b>	A sibling of Bullion developed by Professor Salmon in 1934
<b>Maturity</b>	Medium to late
<b>Yield</b>	2750 kg./ha. or 2400 lb./ac.
<b>Growth Habit</b>	Normal
<b>Disease/Pest Susceptibility</b>	Low resistance to wilt and powdery mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Over-sized, compact cone
<b>Lupulin</b>	Unknown
<b>Aroma</b>	Blackcurrant, fruity, spicy
<b>Alpha Acids</b>	8 – 10% w/w
<b>Beta Acids</b>	3.5 – 4.5% w/w
<b>Co-Humulone</b>	40 – 48% of alpha acids
<b>Storageability</b>	Poor
<b>Total Oil</b>	2.0 – 2.4 mls/100 grams
<b>Myrcene</b>	37 – 40% of whole oil
<b>Humulene</b>	29 – 31% of whole oil
<b>Caryophyllene</b>	7 – 7.5% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Mainly used as a bittering hop
<b>Possible Substitutions</b>	Bullion
<b>Typical Beer Styles</b>	Ale, Pilsners & Lambic
<b>Additional Information</b>	Limited acreage in the US
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US CASCADE

<b>Pedigree</b>	Open pollination of a Fuggle seedling, itself derived from crosses between Fuggle and the Russian hop Serebrianker.
<b>Maturity</b>	Mid-Season
<b>Yield</b>	1600 – 2200 kg./ha or 1430 – 1960 lb./ac.
<b>Growth Habit</b>	Good to excellent
<b>Disease/Pest Susceptibility</b>	Not seriously affected by Prunus necrotic ring-spot virus. Good crown and cone resistance to downy mildew, partly tolerant to Verticillium wilt. Prone to insects, especially Aphids.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Compact, medium sized, slightly square-shaped
<b>Lupulin</b>	Moderate amount, yellow color; develops compact balls of Lupulin in the cone; unique to Cascade
<b>Aroma</b>	Flowery and citrusy. Can have a grapefruit note.
<b>Alpha Acids</b>	4.5 – 7.0% w/w
<b>Beta Acids</b>	4.5 – 7.0% w/w
<b>Co-Humulone</b>	33 – 40% of alpha acids
<b>Storageability</b>	48 – 52% alpha acids remaining after 6 months storage at 20°C
<b>Total Oil</b>	0.8 – 1.5 mls/100 grams
<b>Myrcene</b>	45 – 60% of whole oil
<b>Humulene</b>	10 - 16% of whole oil
<b>Caryophyllene</b>	3 - 6% of whole oil
<b>Farnesene</b>	4 – 8 % of whole oil
<b>General Trade Perception</b>	Aroma variety with well-balanced bittering potential. It is the most popular hop with the craft-brewing industry. Good for dry hopping.
<b>Possible Substitutions</b>	Centennial, Amarillo, to a lesser extent, Columbus
<b>Typical Beer Styles</b>	American-Style Ales, especially Pale Ale, IPA, Porter, Barley wines; Can also be used in Witbier.
<b>Additional Information</b>	Released in 1972 and well-established in US industry. The first commercially accepted American-bred aroma hop.
<b>Personal Notes:</b>	



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### US CENTENNIAL

<b>Pedigree</b>	Selected from a cross between Brewer's Gold and a selected USDA male.
<b>Maturity</b>	Mid-season
<b>Yield</b>	1700 – 2000 kg./ha. or 1500 – 1750 lb./ac.
<b>Growth Habit</b>	Good and neat, well-hopped down
<b>Disease/Pest Susceptibility</b>	No visible reaction to infection with Prunus necrotic ring-spot virus. Moderately resistant to downy mildew and Verticillium wilt.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-sized, dense, compact cone
<b>Lupulin</b>	Abundant, dark yellow in color
<b>Aroma</b>	Medium intensity with floral and citrus tones
<b>Alpha Acids</b>	9.5 – 11.5% w/w
<b>Beta Acids</b>	3.5 – 4.5% w/w
<b>Co-Humulone</b>	29 – 30% of alpha acids
<b>Storageability</b>	60 – 65% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.5 – 2.3 mls/100 grams
<b>Myrcene</b>	45 – 55% of whole oil
<b>Humulene</b>	10 – 18% of whole oil
<b>Caryophyllene</b>	5 – 8% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Very balanced hop, sometimes called a super Cascade
<b>Possible Substitutions</b>	Cascade, possibly Columbus or Chinook. Analytically a blend of 70% Cascade and 30% Columbus will give similar profile.
<b>Typical Beer Styles</b>	All US Ale styles, has been used with US Wheat beers
<b>Additional Information</b>	Named from the Washington State Centennial Celebration. At one time this variety was going to be destroyed for lack of interest by the world's major breweries. Today has found a very favorable following by craft-brewers.

**Personal Notes:**



## Hopunion CBS, LLC

### US CHINOOK

<b>Pedigree</b>	From a cross between Petham Golding and a USDA-selected male with high alpha acids and good storage properties.
<b>Maturity</b>	Mid to late season
<b>Yield</b>	2000 – 2500 kg./ha. or 1780 – 2230 lb./ac.
<b>Growth Habit</b>	Good
<b>Disease/Pest Susceptibility</b>	Tolerant to infection with Prunus necrotic ring-spot virus, moderately resistant to downy mildew. Not excessively sensitive to insects.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Long, medium-compact with turned outward petals
<b>Lupulin</b>	Abundant and yellow-orange color
<b>Aroma</b>	Medium intensity, spicy, piney, distinctive grapefruit
<b>Alpha Acids</b>	12.0 – 14.0% w/w
<b>Beta Acids</b>	3.0 – 4.0% w/w
<b>Co-Humulone</b>	29 – 34% of alpha acids
<b>Storageability</b>	65 – 70% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.5 – 2.5 mls/100 grams
<b>Myrcene</b>	35 – 40% of whole oil
<b>Humulene</b>	20 – 25% of whole oil
<b>Caryophyllene</b>	9 – 11% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A high alpha-acids hop with an acceptable aroma profile.
<b>Possible Substitutions</b>	Nugget, Columbus, Northern Brewer, Wye Target, possibly Centennial
<b>Typical Beer Styles</b>	US Style Pale Ale, IPA, Stout, Porter, Barley Wine, Lager (Bittering)
<b>Additional Information</b>	Released in the US industry in 1985 and becoming increasingly popular with craft-brewers.

**Personal Notes:**





## Hopunion CBS, LLC

### US CLUSTER

<b>Pedigree</b>	Not known but possibly a result of a cross between an English variety and an American male hop.
<b>Maturity</b>	Early to late
<b>Yield</b>	1900 – 2400 kg. /ha. or 1700 – 2140 lb. /ac.
<b>Growth Habit</b>	Vigorous but manageable
<b>Disease/Pest Susceptibility</b>	Very susceptible to downy mildew. Not seriously affected by Prunus necrotic ring-spot virus.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-compact cone
<b>Lupulin</b>	Plentiful, yellow in color
<b>Aroma</b>	Floral and spicy
<b>Alpha Acids</b>	5.5 – 8.5% w/w
<b>Beta Acids</b>	4.5 – 5.5 %w/w
<b>Co-Humulone</b>	36 – 42% of alpha acids
<b>Storageability</b>	80 – 85% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.4 – 0.8 mls/100 grams
<b>Myrcene</b>	45 – 55% of whole oil
<b>Humulene</b>	15 – 18% of whole oil
<b>Caryophyllene</b>	6 – 7% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	An excellent general purpose hop with medium and well-balanced bittering potential and no undesirable aroma properties.
<b>Possible Substitutions</b>	Galena, possibly US Northern Brewer
<b>Typical Beer Styles</b>	Ale (Aroma), Lager (Bittering), Stout
<b>Additional Information</b>	For years the standard US cultivar, improved mass selection in the mid-sixties. Limited acreage grown today.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US COLUMBUS

<b>Pedigree</b>	Bred and selected from the Hopunion breeding program.
<b>Maturity</b>	Mid-season to late
<b>Yield</b>	2250 – 2800 kg./ha. or 2000 – 2500 lb./ac.
<b>Growth Habit</b>	Excellent
<b>Disease/Pest Susceptibility</b>	Has sensitivity to powdery mildew and some sensitivity to downy mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium to large dense, rounded cone
<b>Lupulin</b>	Plentiful, pale to mid-yellow
<b>Aroma</b>	Pungent
<b>Alpha Acids</b>	14 – 16% w/w
<b>Beta Acids</b>	4.5 – 5.5% w/w
<b>Co-Humulone</b>	30 – 35% of alpha acids
<b>Storageability</b>	Below average alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.5 – 2.0 mls/100 grams
<b>Myrcene</b>	25 – 45% of whole oil
<b>Humulene</b>	15 – 25% of whole oil
<b>Caryophyllene</b>	8 – 12% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Originally bred for its alpha value, it has also become popular for its oil profile. Great for dry hopping.
<b>Possible Substitutions</b>	Nugget, Chinook, Wye Target, Northern Brewer, possibly Centennial
<b>Typical Beer Styles</b>	US IPA, US Pale Ale, Stout, Barley Wine, Lager (Bittering)
<b>Additional Information</b>	Also known as Tomahawk. Considered similar to Zeus.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US CRYSTAL

<b>Pedigree</b>	A triploid variety developed from the German Hallertau aroma hop variety with primary contributions from Cascade, Brewer's Gold and Early Green. Released in 1993 to the hop industry.
<b>Maturity</b>	Mid-season
<b>Yield</b>	1350 – 2250 kg./ha. Or 1200 – 2000 lb./ac.
<b>Growth Habit</b>	A fairly strong growing hop
<b>Disease/Pest Susceptibility</b>	Somewhat susceptible to downy mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-sized fairly neat cone
<b>Lupulin</b>	Moderately abundant, normal yellow color
<b>Aroma</b>	Mild, spicy & flowery
<b>Alpha Acids</b>	3.5 – 5.5% w/w
<b>Beta Acids</b>	4.5 – 6.5% w/w
<b>Co-Humulone</b>	20 – 26% of alpha acids
<b>Storageability</b>	50% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.0 – 1.5 mls/100 grams
<b>Myrcene</b>	40 – 65% of whole oil
<b>Humulene</b>	18 – 24% of whole oil
<b>Caryophyllene</b>	4 – 8% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Very popular in the craft-brewing industry. Viewed as the most pungent of the new triploid Hallertau family of hops.
<b>Possible Substitutions</b>	Mt. Hood, Hersbruck, French Strisselspalt, Liberty, Hallertau
<b>Typical Beer Styles</b>	Pilsner, Lager, Kölsch, ESB, Alt, Belgian-Style Ales
<b>Additional Information</b>	Primarily grown in Oregon. Acreage is increasing. Released in the 1990's.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US FUGGLE

<b>Pedigree</b>	A chance seedling selected in 1875 by Mr. Richard Fuggle in England. It has been in the US since the late 1800's.
<b>Maturity</b>	Early
<b>Yield</b>	1200 – 1800 kg./ha. or 1070 – 1600 lbs./ac.
<b>Growth Habit</b>	Neat and manageable
<b>Disease/Pest Susceptibility</b>	Not seriously affected by Prunus necrotic ring-spot virus. Resistant to downy mildew. Not excessively sensitive to insects.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Small and rather light, medium-compact
<b>Lupulin</b>	Moderate amount, yellow color
<b>Aroma</b>	Mild, woody and fruity
<b>Alpha Acids</b>	4.0 – 5.5% w/w
<b>Beta Acids</b>	1.5 – 2.0% w/w
<b>Co-Humulone</b>	25 – 32% of alpha acids
<b>Storageability</b>	60 – 65% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.7 – 1.2 mls/100 grams
<b>Myrcene</b>	40 – 50% of whole oil
<b>Humulene</b>	20 – 26% of whole oil
<b>Caryophyllene</b>	6 – 10% of whole oil
<b>Farnesene</b>	4 – 5% of whole oil
<b>General Trade Perception</b>	Traditional English-type aroma hop
<b>Possible Substitutions</b>	UK Fuggle, Willamette, Styrian Golding, US Tettnang
<b>Typical Beer Styles</b>	Any English-style beer or American Ales, Lambic
<b>Additional Information</b>	Also known overseas as Styrian (Savinja) Golding in Slovenia and as UK Fuggle in England. In the US it has been replaced in part by Willamette (triploid Fuggle), which growers find more favorable.

**Personal Notes:**



## Hopunion CBS, LLC

### US GALENA

<b>Pedigree</b>	Bred from Brewer's Gold by open pollination in the state of Idaho.
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1900 – 2500 kg./ha. or 1700 – 2230 lb./ac.
<b>Growth Habit</b>	Neat and columnar
<b>Disease/Pest Susceptibility</b>	Exhibits reaction to infection with Prunus necrotic ring-spot virus. Some resistance to downy mildew, slightly susceptible to powdery mildew, susceptible to aphids.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-compact and plump
<b>Lupulin</b>	Abundant, yellow in color
<b>Aroma</b>	Citrusy
<b>Alpha Acids</b>	12 – 14% w/w
<b>Beta Acids</b>	7 – 9% w/w
<b>Co-Humulone</b>	38 – 42% of alpha acids
<b>Storageability</b>	75 – 80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.9 – 1.2 mls/100 grams
<b>Myrcene</b>	55 – 60% of whole oil
<b>Humulene</b>	10 – 15% of whole oil
<b>Caryophyllene</b>	3 – 5% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	An excellent high alpha acids hop with balanced bittering properties combines with a good aroma profile.
<b>Possible Substitutions</b>	Nugget
<b>Typical Beer Styles</b>	Can be used in most English-style and American Ales.
<b>Additional Information</b>	Released in 1978.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US GLACIER

<b>Pedigree</b>	Released in 2000
<b>Maturity</b>	Mid-season
<b>Yield</b>	2750 – 2900 kg./ha. or 2400 – 2600 lb./ac.
<b>Growth Habit</b>	Good
<b>Disease/Pest Susceptibility</b>	Susceptible to powdery and downy mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Small cone
<b>Lupulin</b>	Moderately abundant
<b>Aroma</b>	Excellent, pleasant hoppiness
<b>Alpha Acids</b>	5.5% w/w
<b>Beta Acids</b>	8.2% w/w
<b>Co-Humulone</b>	11 – 13% of alpha acids
<b>Storageability</b>	Good
<b>Total Oil</b>	0.7 – 1.6 mls/100 grams
<b>Myrcene</b>	33 – 62% of whole oil
<b>Humulene</b>	24 – 36% of whole oil
<b>Caryophyllene</b>	6.5 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	An excellent new variety with balanced bittering properties combined with a good aroma profile.
<b>Possible Substitutions</b>	Willamette, US Fuggle, US Tettnang, Styrian Golding
<b>Typical Beer Styles</b>	Pale Ale, ESB, Bitter, English-Style Pale Ale, Porter, Stout
<b>Additional Information</b>	Released as a public variety in 2000 by Dr. Stephen Kenny, Washington State University. It was chosen for its low cohumulone and good yield potential.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US GOLDING

<b>Pedigree</b>	The genuine long-established East Kent Golding variety group imported from England. Started by Hopunion in the US in 1993.
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1000 - 1450 kg/ha or 900 - 1300 lbs./ac.
<b>Growth Habit</b>	Average
<b>Disease/Pest Susceptibility</b>	Sensitive to downy mildew and highly sensitive to Hop Mosaic Virus infection.
<b>Pickability/Drying/Baling</b>	Care needed in picking light fluffy cones. Requires adequate conditioning to prevent shatter.
<b>Cone-Structure</b>	Small, light and fluffy
<b>Luplin</b>	Palish yellow and only moderate amounts
<b>Aroma</b>	Mild, delicate classic English-type
<b>Alpha Acids</b>	4.0 – 5.0% w/w
<b>Beta Acids</b>	2.0 – 3.0% w/w
<b>Co-Humulone</b>	20 – 25% of alpha acids
<b>Storageability</b>	65 – 80% of alpha acids remaining after 6 months at 20°C
<b>Total Oil</b>	0.5 – 1.0 mls/100 grams
<b>Myrcene</b>	20 – 35% of whole oil
<b>Humulene</b>	35 – 45% of whole oil
<b>Caryophyllene</b>	10 – 15% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	US Goldings are very popular among ale breweries in the US
<b>Possible Substitutions</b>	UK East Kent Golding, UK Progress and possibly the Fuggle family.
<b>Typical Beer Styles</b>	All English-style beers, especially all Bitters and Pale Ale, Belgian-Style Ales, Barley Wine
<b>Additional Information</b>	UK Golding clones have been introduced for growing here in Washington and Oregon. Before being grown in the US, there was a Golding grown in British Columbia (BC Golding), there are no longer any more BC Golding hops grown.

**Personal Notes:**



## Hopunion CBS, LLC

### US HALLERTAU

<b>Pedigree</b>	Traditional German variety, originally selected in the area of the same name.
<b>Maturity</b>	Early
<b>Yield</b>	900 – 1400 kg./ha. or 800 – 1250 lb./ac.
<b>Growth Habit</b>	Can be variable in production
<b>Disease/Pest Susceptibility</b>	Can display reaction to Prunus necrotic ring-spot virus infection. Fairly sensitive to downy mildew, Verticillium wilt and insects.
<b>Pickability/Drying/Baling</b>	Fair to good
<b>Cone-Structure</b>	Fairly loose, small and light
<b>Lupulin</b>	Moderate amount, quite pale
<b>Aroma</b>	Very mild, slightly flowery and somewhat spicy
<b>Alpha Acids</b>	3.5 – 5.5% w/w
<b>Beta Acids</b>	3.5 – 5.5% w/w
<b>Co-Humulone</b>	18 – 24% of alpha acids
<b>Storageability</b>	52 – 58% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.6 – 1.0 mls/100 grams
<b>Myrcene</b>	35 – 44% of whole oil
<b>Humulene</b>	30 – 38% of whole oil
<b>Caryophyllene</b>	10 – 12% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Traditional German aroma hop
<b>Possible Substitutions</b>	Liberty, German Hallertau, German Tradition
<b>Typical Beer Styles</b>	Lager, Pilsner, Bock, Wheat, Kölsch, Munich Helles, Belgian-Style Ales
<b>Additional Information</b>	Limited acreage grown, though seeing increased popularity among craft-brewers. More expensive than the triploid Hallertau, Mt Hood & Liberty, which have better yield. Have seen, for example, Mt Hood sold as simply Hallertau. If you want Hallertau, make sure you are getting the real thing. If you're not sure, ask!

**Personal Notes:**





## Hopunion CBS, LLC

### US HORIZON

<b>Pedigree</b>	A diploid high alpha, low co-humulone selection. Cross made in Oregon in 1970, half-sister of Nugget.
<b>Maturity</b>	Medium
<b>Yield</b>	2100 - 2300 kg./ha. or 1900 – 2000 lb./ac.
<b>Growth Habit</b>	Moderately vigorous, neat even columnar habit
<b>Disease/Pest Susceptibility</b>	Susceptibility to downy mildew. Moderately resistant Verticillium wilt.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Firm, quite tight
<b>Lupulin</b>	Moderate amount, yellow
<b>Aroma</b>	Floral, spicy
<b>Alpha Acids</b>	11 – 13% w/w
<b>Beta Acids</b>	6.5 – 8.5% w/w
<b>Co-Humulone</b>	16 – 19% of alpha acids
<b>Storageability</b>	Average to good
<b>Total Oil</b>	1.5 – 2.0 mls/100 grams
<b>Myrcene</b>	55 – 65% of whole oil
<b>Humulene</b>	11 – 13% of whole oil
<b>Caryophyllene</b>	7.5 – 9% of whole oil
<b>Farnesene</b>	2.5 – 3.5% of whole oil
<b>General Trade Perception</b>	Good potential as a medium alpha, good aroma, dual purpose hop. Has a low co-humulone, which results in a clean tasting beer.
<b>Possible Substitutions</b>	Magnum
<b>Typical Beer Styles</b>	All Ales and Lagers
<b>Additional Information</b>	Commercially grown in small quantities. Gaining in popularity with the craft-brewing industry.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US LIBERTY

<b>Pedigree</b>	Cross between colchicines-induced tetraploid female hop cultivar Hallertauer Mittlefruh and downy mildew resistant male.
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1100 – 1900 kg./ha. or 1000 – 1700 lb./ac.
<b>Growth Habit</b>	Columnar and quite vigorous
<b>Disease/Pest Susceptibility</b>	Moderately resistant to downy mildew. No Verticillium wilt symptoms observed.
<b>Pickability/Drying/Baling</b>	Fair to good
<b>Cone-Structure</b>	Smallish plump, dense cones
<b>Lupulin</b>	Moderate amounts, dark yellow in color
<b>Aroma</b>	Mild with a slightly spicy character
<b>Alpha Acids</b>	3.0 – 5.0% w/w
<b>Beta Acids</b>	3.0 – 4.0% w/w
<b>Co-Humulone</b>	24 – 30% of alpha acids
<b>Storageability</b>	35 – 55% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.6 – 1.2 mls/100 grams
<b>Myrcene</b>	20 – 40% of whole oil
<b>Humulene</b>	35 – 40% of whole oil
<b>Caryophyllene</b>	9 – 12% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Aroma variety with close similarities to imported German aroma varieties, especially Hallertau.
<b>Possible Substitutions</b>	US or German Hallertau, German Tradition, Mt Hood, possibly Spalt
<b>Typical Beer Styles</b>	Lager, Pilsner, Bock, US Wheat, Kölsch
<b>Additional Information</b>	Released in the US in 1991. Of the four triploid Hallertau varieties released, Liberty most closely resembles the Hallertau cultivar.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US MAGNUM

<b>Pedigree</b>	Bred at the Hop Research Institute in Hüll (Germany)
<b>Maturity</b>	Late
<b>Yield</b>	1900 – 2000 kg./ha. or 1340 – 1700 lb./ac.
<b>Growth Habit</b>	Good
<b>Disease/Pest Susceptibility</b>	Good resistance to wilt and downy mildew, susceptible to powdery mildew
<b>Pickability/Drying/Baling</b>	Below average
<b>Cone-Structure</b>	Large cone
<b>Lupulin</b>	Plentiful
<b>Aroma</b>	No real distinct aroma character, so is viewed favorably as a clean bittering hop
<b>Alpha Acids</b>	12 – 14% w/w
<b>Beta Acids</b>	4.5 – 6% w/w
<b>Co-Humulone</b>	24 – 28% of alpha acids
<b>Storageability</b>	Very good alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.9 – 2.3 mls/100 grams
<b>Myrcene</b>	30 – 35% of whole oil
<b>Humulene</b>	34 – 40% of whole oil
<b>Caryophyllene</b>	8 – 12% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Gaining increasing acceptance as a clean bittering hop.
<b>Possible Substitutions</b>	German Magnum, possibly Horizon
<b>Typical Beer Styles</b>	Good bittering hop for all Ales and Lagers
<b>Additional Information</b>	Limited acreage in the US, but widely grown in Germany.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US MILLENIUM

<b>Pedigree</b>	Millennium is a triploid, high alpha acids variety, with Nugget as the mother.
<b>Maturity</b>	Middle-Late
<b>Yield</b>	2750 – 2900 kg./ha. or 2400 – 2600 lb./ac.
<b>Growth Habit</b>	Vigorous
<b>Disease/Pest Susceptibility</b>	Appears fairly resistant to most diseases, including Powdery Mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Heavy, compact
<b>Lupulin</b>	Yellow
<b>Aroma</b>	Mild, Herbal, similar to Nugget
<b>Alpha Acids</b>	15.5% w/w
<b>Beta Acids</b>	4.8% w/w
<b>Co-Humulone</b>	30% of alpha acids
<b>Storageability</b>	24% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	2.0 mls/100 grams
<b>Myrcene</b>	Great variation
<b>Humulene</b>	25% of whole oil
<b>Caryophyllene</b>	10.6% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Very new hop. Primarily used for alpha potential
<b>Possible Substitutions</b>	Nugget and Columbus
<b>Typical Beer Styles</b>	Ales, Stout, Barley Wine
<b>Additional Information</b>	Released by John I Haas
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US MOUNT HOOD

<b>Pedigree</b>	A triploid seedling of the German Hallertauer variety
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1700 – 2200 kg./ha. or 1520 – 1960 lb./ac.
<b>Growth Habit</b>	Fairly vigorous but manageable
<b>Disease/Pest Susceptibility</b>	Moderately resistant to downy mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-size and fairly compact
<b>Lupulin</b>	Moderate amount, yellow in color
<b>Aroma</b>	Mild, somewhat pungent
<b>Alpha Acids</b>	5.0 – 8.0% w/w
<b>Beta Acids</b>	5.0 – 7.5% w/w
<b>Co-Humulone</b>	22 – 23% of alpha acids
<b>Storageability</b>	50 -60% alpha acid remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.0 – 1.3 mls/100 grams
<b>Myrcene</b>	55 – 65% of whole oil
<b>Humulene</b>	15 – 25% of whole oil
<b>Caryophyllene</b>	7 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Aroma variety with marked similarities to the German Hallertauer and Hersbrucker varieties. Most popular hop in the triploid Hallertau breeding program, partly due to the fact it was the first one released.
<b>Possible Substitutions</b>	Crystal, French Strisselspalt, Hersbrucker
<b>Typical Beer Styles</b>	Lager, Pilsner, Bock, US Wheat, Alt, Munich Helles
<b>Additional Information</b>	Released in the US in 1989.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US NEWPORT

<b>Pedigree</b>	Open pollination
<b>Maturity</b>	Moderately late
<b>Yield</b>	2300 – 2840 kg/ha. or 1990 – 2550 lb./ac.
<b>Growth Habit</b>	Good
<b>Disease/Pest Susceptibility</b>	Resistance to both powdery and downy mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-large, somewhat loose
<b>Lupulin</b>	Moderate, Yellow in color
<b>Aroma</b>	Mild
<b>Alpha Acids</b>	13.5 – 17% w/w
<b>Beta Acids</b>	7.2 – 9.1% w/w
<b>Co-Humulone</b>	36 – 38% of alpha acids
<b>Storageability</b>	60% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.6 – 3.36 mls/100 grams
<b>Myrcene</b>	47 – 54% of whole oil
<b>Humulene</b>	9 – 14% of whole oil
<b>Caryophyllene</b>	4.5 – 7% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Viewed as a high-bittering alpha hop.
<b>Possible Substitutions</b>	Galena, Nugget, Fuggle, Magnum, Brewer's Gold
<b>Typical Beer Styles</b>	Ales, Stout, Barley Wine
<b>Additional Information</b>	One of the newest varieties to be released in the US (Year 2002)
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US NORTHERN BREWER

<b>Pedigree</b>	Bred in England in 1934 from a cross between a female hop of wild American parentage and an English male.
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1200 – 1600 kg./ha. or 1000 – 1400 lb./ac.
<b>Growth Habit</b>	Adequate in temperate climates but has difficulty growing when under heat stress.
<b>Disease/Pest Susceptibility</b>	Susceptible to downy mildew, no strong virus reactions. Has resistance to aphids and mites.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-sized cone, only fairly tight. Prone to develop leaves in cones, also called “cock hops.”
<b>Lupulin</b>	Medium yellow. Fairly abundant
<b>Aroma</b>	Medium -strong
<b>Alpha Acids</b>	8 – 10% w/w
<b>Beta Acids</b>	3 – 5% w/w
<b>Co-Humulone</b>	20 – 30 % of alpha acids
<b>Storageability</b>	70 – 85% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.5 – 2.0 mls/100 grams
<b>Myrcene</b>	50 – 60% of whole oil
<b>Humulene</b>	20 – 30 % of whole oil
<b>Caryophyllene</b>	5 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A true dual-purpose hop, containing moderate amounts of alpha acids combined with a good aroma profile.
<b>Possible Substitutions</b>	German Northern Brewer, Chinook
<b>Typical Beer Styles</b>	All English-styles, especially Porter, American Ales, Kölsch, Munich Helles
<b>Additional Information</b>	A major alpha hop in Germany, but declining in areas in England. Limited acreage in the US.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US NUGGET

<b>Pedigree</b>	Selected from a cross between Brewer's Gold and a high alpha acids male with good storage properties.
<b>Maturity</b>	Mid-season
<b>Yield</b>	1900 – 2500 kg./ha. or 1700 – 2230 lb./ac.
<b>Growth Habit</b>	Good
<b>Disease/Pest Susceptibility</b>	Little visual reaction to infection with Prunus necrotic ring-spot virus. Moderate to good resistance to downy mildew, but susceptible to spider mites.
<b>Pickability/Drying/Baling</b>	Very good
<b>Cone-Structure</b>	Heavy, tight and moderately long
<b>Lupulin</b>	Plentiful and yellow-orange in color
<b>Aroma</b>	Herbal
<b>Alpha Acids</b>	12 – 14% w/w
<b>Beta Acids</b>	4 – 6% w/w
<b>Co-Humulone</b>	24 – 30% of alpha acids
<b>Storageability</b>	70 – 80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.7 – 2.3 mls/100 grams
<b>Myrcene</b>	51 – 59% of whole oil
<b>Humulene</b>	12 – 22% of whole oil
<b>Caryophyllene</b>	7 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A high alpha acids hop with a good aroma profile.
<b>Possible Substitutions</b>	Galena, Magnum, Columbus, Wye Target
<b>Typical Beer Styles</b>	Ales, Stout, Barley Wine
<b>Additional Information</b>	Released in 1982 and now a major high alpha acids variety in the US. Also grown in Germany.
<b>Personal Notes:</b>	





## Hopunion CBS, LLC

### US PERLE

<b>Pedigree</b>	Bred in Germany from the English Northern Brewer variety.
<b>Maturity</b>	Early
<b>Yield</b>	1300 – 1800 kg./ha. or 1160 – 1600 lb./ac.
<b>Growth Habit</b>	Good – Does not like hot weather
<b>Disease/Pest Susceptibility</b>	Mainly tolerant to Prunus necrotic ring-spot virus infection. Fairly resistant to downy mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Fairly loose, medium-long
<b>Lupulin</b>	Plentiful, fairly dark yellow
<b>Aroma</b>	Floral and slightly spicy
<b>Alpha Acids</b>	7 – 9.5% w/w
<b>Beta Acids</b>	4 – 5% w/w
<b>Co-Humulone</b>	27 – 32% of alpha acids
<b>Storageability</b>	80 – 85% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.7 – 0.9 mls/100 grams
<b>Myrcene</b>	45 – 55% of whole oil
<b>Humulene</b>	28 – 33% of whole oil
<b>Caryophyllene</b>	10 -12% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A hop with German type aroma properties combines with moderate bittering potential. A dual purpose hop. Popular with craft-brewers.
<b>Possible Substitutions</b>	German Perle, German and US Northern Brewer
<b>Typical Beer Styles</b>	Pale Ale, Porter, Stout, Lager, Weizen, Alt, Barley Wine, Kölsch
<b>Additional Information</b>	Excellent storagability.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US SAAZ

<b>Pedigree</b>	US equivalent of the Czech variety of the same name/
<b>Maturity</b>	Early
<b>Yield</b>	650 – 1150 kg./ha. or 600 – 1000 lb./ac.
<b>Growth Habit</b>	Difficult hop to grow. Yields can vary greatly from year to year.
<b>Disease/Pest Susceptibility</b>	Some tolerance to downy mildew but prone to virus symptoms under certain conditions.
<b>Pickability/Drying/Baling</b>	Good, tend to shatter if over-ripe.
<b>Cone-Structure</b>	Small, light, fluffy cone
<b>Lupulin</b>	Limited amount, pale yellow
<b>Aroma</b>	Very mild, spicy and earthy
<b>Alpha Acids</b>	3.0 – 4.5% w/w
<b>Beta Acids</b>	3.0 – 4.5% w/w
<b>Co-Humulone</b>	24 – 28% of alpha acids
<b>Storageability</b>	45 – 55% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.5 – 1.0 mls/100 grams
<b>Myrcene</b>	25 – 30% of whole oil
<b>Humulene</b>	35 – 40% of whole oil
<b>Caryophyllene</b>	9 – 11% of whole oil
<b>Farnesene</b>	9 – 13% of whole oil
<b>General Trade Perception</b>	Available in small quantities.
<b>Possible Substitutions</b>	Czech Saaz, Polish Lublin, Sterling
<b>Typical Beer Styles</b>	Pilsner, Lager, US Wheat, Belgian-Style Ales, Bitter
<b>Additional Information</b>	High ambient temperatures can have an adverse effect on yields.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US SANTIAM

<b>Pedigree</b>	Triploid aroma selection using a diploid Tettngang clone and a tetraploid Hallertauer. Released in 1997.
<b>Maturity</b>	Medium
<b>Yield</b>	1600 – 2350 kg./ha. or 1400 – 2100 lb./ac.
<b>Growth Habit</b>	Very good
<b>Disease/Pest Susceptibility</b>	Resistant to downy mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Small, medium density
<b>Lupulin</b>	Moderate amount
<b>Aroma</b>	Floral, slightly spicy
<b>Alpha Acids</b>	5 – 7% w/w
<b>Beta Acids</b>	6 – 8% w/w
<b>Co-Humulone</b>	22 – 24% of alpha acids
<b>Storageability</b>	Average
<b>Total Oil</b>	1.3 – 1.5 mls/100 grams
<b>Myrcene</b>	27 – 36% of whole oil
<b>Humulene</b>	23 – 26% of whole oil
<b>Caryophyllene</b>	7 – 8% of whole oil
<b>Farnesene</b>	13 – 16% of whole oil
<b>General Trade Perception</b>	A newly developed American aroma hop that contains noble hop characteristics.
<b>Possible Substitutions</b>	German Tettngang, German Spalt, German Spalter Select
<b>Typical Beer Styles</b>	Lager, US Ales, Pilsner, Belgian Tripel and other Belgian-Styles, Kölsch, Bock, Munich Helles
<b>Additional Information</b>	Limited but stable acreage.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US SIMCOE™

<b>Pedigree</b>	Released in 2000
<b>Maturity</b>	Medium
<b>Yield</b>	2650 – 2880 kg./ha. or 2300 – 2500 lb./ac.
<b>Growth Habit</b>	Not overly vigorous
<b>Disease/Pest Susceptibility</b>	Moderate tolerance to powdery mildew, Spaerotheca.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-size
<b>Lupulin</b>	Bright yellow
<b>Aroma</b>	Very unique, pine-like aroma
<b>Alpha Acids</b>	12 – 14% w/w
<b>Beta Acids</b>	4 – 5% w/w
<b>Co-Humulone</b>	15 – 20% of alpha acids
<b>Storageability</b>	Good
<b>Total Oil</b>	2 – 2.5 mls/100 grams
<b>Myrcene</b>	60 -65% of whole oil
<b>Humulene</b>	10 – 15% of whole oil
<b>Caryophyllene</b>	5 – 8% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Used for aromatic, and especially bittering properties
<b>Possible Substitutions</b>	Unknown
<b>Typical Beer Styles</b>	American Ales
<b>Additional Information</b>	Known as a bittering hop with good aroma characteristics

**Personal Notes:**



## Hopunion CBS, LLC

### US STERLING

<b>Pedigree</b>	Released in 1998
<b>Maturity</b>	Medium
<b>Yield</b>	2020 – 2245 kg./ha. or 1800 – 2000 lb./ac.
<b>Growth Habit</b>	Moderately vigorous
<b>Disease/Pest Susceptibility</b>	Moderately resistant to downy mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium
<b>Lupulin</b>	Pale yellow
<b>Aroma</b>	Herbal, spicy with a hint of floral and citrus
<b>Alpha Acids</b>	6 – 9% w/w
<b>Beta Acids</b>	4 – 6% w/w
<b>Co-Humulone</b>	22 – 28% of alpha acids
<b>Storageability</b>	Good alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.3 – 1.9 mls/100 grams
<b>Myrcene</b>	44 – 48% of whole oil
<b>Humulene</b>	19 – 23% of whole oil
<b>Caryophyllene</b>	5 – 7% of whole oil
<b>Farnesene</b>	11 – 17% of whole oil
<b>General Trade Perception</b>	Perceived to be similar to a Saaz and Mt Hood combination. Finding favor as a Saaz replacement.
<b>Possible Substitutions</b>	Czech Saaz
<b>Typical Beer Styles</b>	Pilsner and other Lagers, Ales and Belgian-Style Ales
<b>Additional Information</b>	Limited, but stable acreage.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US TETTNANG

<b>Pedigree</b>	Commercially grown in the US since the 1980's.
<b>Maturity</b>	Early
<b>Yield</b>	1000 – 1500 kg./ha. or 900 – 1340 lb./ac.
<b>Growth Habit</b>	Fairly neat
<b>Disease/Pest Susceptibility</b>	Can display reaction to Prunus necrotic ring-spot virus infection. Moderately resistant to downy mildew. Sensitive to insects, in particular mites.
<b>Pickability/Drying/Baling</b>	Fair to good
<b>Cone-Structure</b>	Medium-compact, fairly small light cone
<b>Lupulin</b>	Moderate amount, pale yellow
<b>Aroma</b>	Slightly spicy
<b>Alpha Acids</b>	4.0 – 5.0% w/w
<b>Beta Acids</b>	3.0 – 4.0% w/w
<b>Co-Humulone</b>	20 -25% of alpha acids
<b>Storageability</b>	55 – 60% of alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.4 – 0.8 mls/100 grams
<b>Myrcene</b>	36 – 45% of whole oil
<b>Humulene</b>	18 – 23% of whole oil
<b>Caryophyllene</b>	6 – 7% of whole oil
<b>Farnesene</b>	5 – 8% of whole oil
<b>General Trade Perception</b>	A true noble aroma variety
<b>Possible Substitutions</b>	German Spalt Select, German Spalt, Santiam
<b>Typical Beer Styles</b>	Lager, US Ales, Pilsner, US Wheat, Bitter
<b>Additional Information</b>	US Tettnang is similar to Fuggie. A very popular hop with the craft-brewery industry.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US VANGUARD

<b>Pedigree</b>	From a cross made in 1982 between USDA accessions 21285 (a Hallertau mf daughter) and 64037M.
<b>Maturity</b>	Early
<b>Yield</b>	1500 – 1650 kg./ha. or 1350 – 1475 lb./ac.
<b>Growth Habit</b>	Columnar. Good spring growth. The shoots are upright and easy to train. The shoots are light yellow and turn green as they climb the string.
<b>Disease/Pest Susceptibility</b>	Resistance to hop downy mildew similar to that of the cultivars Nugget and Willamette
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Small to medium-sized, fairly light.
<b>Lupulin</b>	Light yellow
<b>Aroma</b>	Similar to Hallertau.
<b>Alpha Acids</b>	5.5% - 6% w/w
<b>Beta Acids</b>	6 – 7% w/w
<b>Co-Humulone</b>	14 – 16% of alpha acids
<b>Storageability</b>	75 – 80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	.9 – 1.2 mls/100 grams
<b>Myrcene</b>	20 – 25% of whole oil
<b>Humulene</b>	45 – 50% of whole oil
<b>Caryophyllene</b>	12 – 14% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Still being tested and looked at by micro & craft breweries.
<b>Possible Substitutions</b>	Hallertau, German Hersbrucker, Mt Hood, Liberty
<b>Typical Beer Styles</b>	Lager, Pilsner, Bock, Kölsch, Wheat, Munich Helles, Belgian-Style Ales
<b>Additional Information</b>	Similar to Hallertau Mittlefruh
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### US WARRIOR™

<b>Pedigree</b>	Unknown
<b>Maturity</b>	Medium
<b>Yield</b>	2750 – 3000 kg./ha. 2400 – 2600 lb./ac.
<b>Growth Habit</b>	Vigorous
<b>Disease/Pest Susceptibility</b>	Moderate tolerance to powdery mildew, Spaerotheca.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-sized
<b>Lupulin</b>	Bright yellow
<b>Aroma</b>	Very mild
<b>Alpha Acids</b>	15 – 17% w/w
<b>Beta Acids</b>	4.5 – 5.5% w/w
<b>Co-Humulone</b>	24 - ???% of alpha acids
<b>Storageability</b>	Good
<b>Total Oil</b>	1.0 – 2.0 mls/100 grams
<b>Myrcene</b>	40 – 50% of whole oil
<b>Humulene</b>	15 – 20% of whole oil
<b>Caryophyllene</b>	8 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	New hop with much potential. Very stable.
<b>Possible Substitutions</b>	Nugget, Columbus
<b>Typical Beer Styles</b>	Pale Ale, IPA
<b>Additional Information</b>	Very grower friendly
<b>Personal Notes:</b>	





## Hopunion CBS, LLC

### US WILLAMETTE

<b>Pedigree</b>	A triploid seedling of the English Fuggle variety.
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1500 – 1900 kg./ha. or 1340 – 1700 lb./ac.
<b>Growth Habit</b>	Good, vigorous but manageable
<b>Disease/Pest Susceptibility</b>	No visible reaction to Prunus necrotic ring-spot virus. Fair resistance to downy mildew. Susceptible to Verticillium wilt. Some susceptibility to powdery mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Small to medium sized, round, and fairly light
<b>Lupulin</b>	Moderate amount, golden yellow in color
<b>Aroma</b>	Mild and pleasant, slightly spicy
<b>Alpha Acids</b>	4.0 – 6.0% w/w
<b>Beta Acids</b>	3.0 – 4.0% w/w
<b>Co-Humulone</b>	30 -35% of alpha acids
<b>Storageability</b>	60 – 65% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.0 – 1.5% mls/100 grams
<b>Myrcene</b>	45 – 55% of whole oil
<b>Humulene</b>	20 – 30% of whole oil
<b>Caryophyllene</b>	7 – 8% of whole oil
<b>Farnesene</b>	5 – 6% of whole oil
<b>General Trade Perception</b>	A quality aroma hop
<b>Possible Substitutions</b>	US Fuggle, US Tettnang, Styrian Golding
<b>Typical Beer Styles</b>	All English-style Ales, and US Pale and Brown Ales.
<b>Additional Information</b>	Released in 1976 and well-established in the US industry. Currently the most widely grown aroma hops in the US.

**Personal Notes:**



## Hopunion CBS, LLC

### CZECH SAAZ

<b>Pedigree</b>	Czech aroma landrace variety selected in the area of the same name.
<b>Maturity</b>	Various maturities in different clonal selections
<b>Yield</b>	900 – 1500 kg./ha. Or 800 – 1350 lb./ac.
<b>Growth Habit</b>	Some clones quite vigorous, others weak
<b>Disease/Pest Susceptibility</b>	Susceptible to downy and powdery mildew. Not tolerant to hop wilt. Shows increased productivity when freed of viruses.
<b>Pickability/Drying/Baling</b>	Tendency to cone shatter if handled roughly
<b>Cone-Structure</b>	Smallish, light cone
<b>Lupulin</b>	Not abundant, pale yellow color
<b>Aroma</b>	Very mild with pleasant hoppy notes
<b>Alpha Acids</b>	3 – 4.5% w/w
<b>Beta Acids</b>	3 – 4.5% w/w
<b>Co-Humulone</b>	24 – 28% of alpha acids
<b>Storageability</b>	45 – 55% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.4 – 0.7 mls/100 grams
<b>Myrcene</b>	20 – 25% of whole oil
<b>Humulene</b>	40 – 45% of whole oil
<b>Caryophyllene</b>	10 – 12% of whole oil
<b>Farnesene</b>	11 – 15% of whole oil
<b>General Trade Perception</b>	The classical “noble” aroma hop with long and strong traditions. Associated with the renowned Pilsner lager.
<b>Possible Substitutions</b>	US Saaz, Polish Lublin, US Sterling
<b>Typical Beer Styles</b>	Pilsner, Lagers, Belgian-Style Ales, Lambic, sometimes Bitter
<b>Additional Information</b>	By far the predominant Czech variety and clones of it are grown in Poland and the Ukraine.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### FRENCH STRISSELSPALT

<b>Pedigree</b>	Major aroma hops of the Alsace area of France near Strasbourg.
<b>Maturity</b>	Late
<b>Yield</b>	1500 – 2000 kg./ha. or 1350 – 1800 lb./ac.
<b>Growth Habit</b>	Quite vigorous and moderately prolific cone producer
<b>Disease/Pest Susceptibility</b>	Susceptible to English and French wilt strains. Not resistant to downy mildew or powdery mildews.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Plumpish, medium-sized cone with fairly tight strig
<b>Lupulin</b>	Quite dark yellow, moderately abundant
<b>Aroma</b>	Medium intensity, pleasant and hoppy
<b>Alpha Acids</b>	3 – 5% w/w
<b>Beta Acids</b>	3 – 5.5% w/w
<b>Co-Humulone</b>	20 – 25% of alpha acids
<b>Storageability</b>	60 – 70% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.6 – 0.9 mls/100 grams
<b>Myrcene</b>	20 – 30% of whole oil
<b>Humulene</b>	15 – 25% of whole oil
<b>Caryophyllene</b>	8 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Good to very good aroma hop
<b>Possible Substitutions</b>	Mt Hood, Crystal, Hersbruck
<b>Typical Beer Styles</b>	Pilsner, Lager, Wheat
<b>Additional Information</b>	Well accepted as good aroma hop around the world. Similar to Hersbruck in profile but preferred by some breweries.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR BREWER'S GOLD

<b>Pedigree</b>	Released in 1934
<b>Maturity</b>	Late
<b>Yield</b>	2150 – 2350 kg./ha. or 1950 – 2100 lb./ac.
<b>Growth Habit</b>	Vigorous
<b>Disease/Pest Susceptibility</b>	Low resistance to wilt and powdery mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Small and tight
<b>Lupulin</b>	Full
<b>Aroma</b>	Black currant, fruity, spicy
<b>Alpha Acids</b>	5.5 – 6.5% w/w
<b>Beta Acids</b>	2.5 – 3.5% w/w
<b>Co-Humulone</b>	40 – 48% of alpha acids
<b>Storageability</b>	Average
<b>Total Oil</b>	1.8 – 2.2 mls/100 grams
<b>Myrcene</b>	37 – 40% of whole oil
<b>Humulene</b>	29 – 31% of whole oil
<b>Caryophyllene</b>	7 – 7.5% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Mainly used as a bittering hop
<b>Possible Substitutions</b>	UK Northdown, Northern Brewer, Galena, Bullion, US Brewer's Gold
<b>Typical Beer Styles</b>	Ale, heavier German style Lagers, Lambic
<b>Additional Information</b>	Originally bred in the UK by Professor E.S. Salmon
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR HALLERTAU

<b>Pedigree</b>	At one time the major Hallertau landrace variety with a highly acclaimed aroma profile.
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1300 – 1800 kg./ha. or 1150 – 1600 lb./ac.
<b>Growth Habit</b>	Moderately vigorous on most soil types
<b>Disease/Pest Susceptibility</b>	Sensitive to German wilt which resulted in reduction of its acreage and replacement by Hersbrucker over the 1970's and 1980's.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Lightish, fluffy cone
<b>Lupulin</b>	Pale to medium yellow in color
<b>Aroma</b>	Mild and pleasant
<b>Alpha Acids</b>	3.5 – 5.5% w/w
<b>Beta Acids</b>	3 – 4% w/w
<b>Co-Humulone</b>	17 – 24% of alpha acids
<b>Storageability</b>	50 – 60% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.7 – 1.3 mls/100 grams
<b>Myrcene</b>	10 – 20% of whole oil
<b>Humulene</b>	30 – 35% of whole oil
<b>Caryophyllene</b>	7 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	The classic German aroma hop associated with Bavarian style lager beers.
<b>Possible Substitutions</b>	Liberty, German Tradition, Ultra
<b>Typical Beer Styles</b>	Lager, Bock, Pilsner, Weizen, Belgian-Style Ales, Alt, Lambic, Kölsch, Munich Ales
<b>Additional Information</b>	Limited areas grown in the US, tends to grow best in the milder climates of Oregon and northern Idaho.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR HERSBRUCKER

<b>Pedigree</b>	Traditional German landrace variety selected in the Hersbruck area.
<b>Maturity</b>	Late
<b>Yield</b>	1600 – 2000 kg./ha. or 1400 – 1800 lb./ac.
<b>Growth Habit</b>	Quite vigorous and croppy
<b>Disease/Pest Susceptibility</b>	Fair to good resistance to German strains of Verticillium wilt. No resistance to downy mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Plump, round, medium-sized cone and quite light
<b>Lupulin</b>	Moderate amount, dark yellow in color
<b>Aroma</b>	Mild to semi-strong, pleasant and hoppy
<b>Alpha Acids</b>	3 – 5.5% w/w
<b>Beta Acids</b>	4 – 5.5% w/w
<b>Co-Humulone</b>	19 – 25% of alpha acids
<b>Storageability</b>	55 – 65% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.7 – 1.3 mls/100 grams
<b>Myrcene</b>	15 – 25% of whole oil
<b>Humulene</b>	15 – 25% of whole oil
<b>Caryophyllene</b>	7 – 12% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Good to very good aroma hop.
<b>Possible Substitutions</b>	Mt Hood, French Strisselspalt
<b>Typical Beer Styles</b>	Lager, Pilsner, Bock, Weizen Bock, Wheat, Belgian-Style Ales, Kölsch, Munich Helles
<b>Additional Information</b>	Grown widely not only in the Hallertau but also in Spalt and Hersbruck areas.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR MAGNUM

<b>Pedigree</b>	Bred at the Hop Research Institute in Hüll (Germany)
<b>Maturity</b>	Late
<b>Yield</b>	1900 – 2100 kg./ha. or 1340 – 1700 lb./ac.
<b>Growth Habit</b>	Average
<b>Disease/Pest Susceptibility</b>	Good resistance to wilt and peronospora, low resistance to powdery mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Large cone
<b>Lupulin</b>	Plentiful
<b>Aroma</b>	No real distinct aroma character, so is viewed favorably as a clean bittering hop
<b>Alpha Acids</b>	12 – 14% w/w
<b>Beta Acids</b>	4.5 – 5% w/w
<b>Co-Humulone</b>	24 – 25% of alpha acids
<b>Storageability</b>	Very good
<b>Total Oil</b>	1.9 – 2.3 mls/100 grams
<b>Myrcene</b>	30 – 35% of whole oil
<b>Humulene</b>	34 – 40% of whole oil
<b>Caryophyllene</b>	8 – 12% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	This high-alpha variety is a very promising new breed from the Hop Research Institution in Hüll with good resistance characteristics, high yield and good growth.
<b>Possible Substitutions</b>	Columbus, Nugget
<b>Typical Beer Styles</b>	Lagers, Pilsner types, Stout, Ales. Typically base bitterness in Lager beers (commonly used as a first hop addition) and at the same time, used by many ale brewers too.
<b>Additional Information</b>	Hallertau Magnum is the second largest hop variety and the main high alpha variety grown in Germany.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR NORTHERN BREWER

<b>Pedigree</b>	One of the original medium to high alpha hops, bred in England and later grown also in Belgium, Spain, Germany and the US.
<b>Maturity</b>	Early – Mid season
<b>Yield</b>	1800 – 2400 kg./ha. or 1600 – 2150 lb./ac.
<b>Growth Habit</b>	Quite vigorous and strong growing
<b>Disease/Pest Susceptibility</b>	Susceptible to downy and powdery mildew but tolerant to German hop wilt. No strong virus reactions.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-sized cone, only fairly compact. Variety prone to produce leaves in cones – “cock hops”
<b>Lupulin</b>	Medium yellow, fairly abundant
<b>Aroma</b>	Medium-strong with some wild American tones
<b>Alpha Acids</b>	7 – 10% w/w
<b>Beta Acids</b>	3.5 – 5% w/w
<b>Co-Humulone</b>	28 – 33% of alpha acids
<b>Storageability</b>	70 – 80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.6 – 2.1 mls/100 grams
<b>Myrcene</b>	30 – 35% of whole oil
<b>Humulene</b>	25 – 30% of whole oil
<b>Caryophyllene</b>	8 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A true dual-purpose hop containing moderate amounts of alpha acids combined with an acceptable aroma profile.
<b>Possible Substitutions</b>	Chinook, US Northern Brewer, German Brewer’s Gold
<b>Typical Beer Styles</b>	ESB, Bitter, English Pale Ale, Porter, Lager, Lambic, Munich Helles
<b>Additional Information</b>	Although declining in area in England, this variety is one of the main high-alpha hops in Germany.
<b>Personal Notes:</b>	





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### GR PERLE

<b>Pedigree</b>	Bred at the Hüll Hop Research Institute from the English Northern Brewer variety.
<b>Maturity</b>	Mid-season to late
<b>Yield</b>	1750 – 2200 kg./ha. or 1550 – 1950 lb./ac.
<b>Growth Habit</b>	Moderately vigorous and easy to grow
<b>Disease/Pest Susceptibility</b>	Good tolerance to German wilt and downy mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Smallish, plump but quite tight cone
<b>Lupulin</b>	Quite copious and fairly dark in color
<b>Aroma</b>	Moderately intense, good and hoppy
<b>Alpha Acids</b>	6 – 8% w/w
<b>Beta Acids</b>	3.5 – 5.5% w/w
<b>Co-Humulone</b>	25 – 32% of alpha acids
<b>Storageability</b>	70 -80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.8 – 1.3 mls/100 grams
<b>Myrcene</b>	10 – 20% of whole oil
<b>Humulene</b>	30 – 36% of whole oil
<b>Caryophyllene</b>	8 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A well accepted dual-purpose hop with a good combination balanced bittering and highly acceptable aroma properties
<b>Possible Substitutions</b>	US Perle, Northern Brewer
<b>Typical Beer Styles</b>	Pale Ale, Porter, Stout, Lager, Pilsner, Weizen, Ale, Alt, Kölsch, Munich Helles
<b>Additional Information</b>	Introduced in the 1980's and grown in both Washington and Oregon states. Perle is the most popular German-grown hop variety.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR SELECT

<b>Pedigree</b>	Bred from Hallertauer Mittelfrüh and Spalt as a disease resistant Spalt type. Originated from Hüll Research Institution.
<b>Maturity</b>	Medium late
<b>Yield</b>	1850 – 2100 kg./ha. or 1650 – 1875 lb./ac.
<b>Growth Habit</b>	Vigorous grower with large head of long laterals
<b>Disease/Pest Susceptibility</b>	Resistant to both Verticillium wilt and downy mildew
<b>Pickability/Drying/Baling</b>	Difficult if over vigorous
<b>Cone-Structure</b>	Smallish tight and quite dark cone
<b>Lupulin</b>	Moderate amounts, mid to deep yellow in color
<b>Aroma</b>	Very fine Spalter type aroma
<b>Alpha Acids</b>	4 – 6% w/w
<b>Beta Acids</b>	3.5 – 4.5% w/w
<b>Co-Humulone</b>	21 – 25% of alpha acids
<b>Storageability</b>	Good
<b>Total Oil</b>	0.5 – 1.0 mls/100 grams
<b>Myrcene</b>	15 – 25% of whole oil
<b>Humulene</b>	15 – 25% of whole oil
<b>Caryophyllene</b>	7 – 11% of whole oil
<b>Farnesene</b>	15 – 25% of whole oil
<b>General Trade Perception</b>	Too early for general consensus but bred to be like the Spalt/Tettnang/Saaz group
<b>Possible Substitutions</b>	US Saaz, US Tettnang, German Spalt, German Tettnang, German Hersbrucker
<b>Typical Beer Styles</b>	Lager, any beer where noble aroma is wanted (i.e. Pilsner)
<b>Additional Information</b>	Released in 1991 and seeing some limited expansion in German growing areas.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR SPALT

<b>Pedigree</b>	Traditional German landrace variety selected and grown in the area of the same name.
<b>Maturity</b>	Medium - early
<b>Yield</b>	1200 – 1600 kg./ha or 1000 – 1400 lb./ac.
<b>Growth Habit</b>	Vigorous with long laterals but not prolific cone producer.
<b>Disease/Pest Susceptibility</b>	Field resistance to German strains of <i>Verticillium</i> wilt and some tolerance to downy mildew
<b>Pickability/Drying/Baling</b>	Fair to good but light cones
<b>Cone-Structure</b>	Smallish but fairly tight cone
<b>Lupulin</b>	Fair amount pale yellow in color
<b>Aroma</b>	Mild and pleasant, slightly spicy
<b>Alpha Acids</b>	4 – 5% w/w
<b>Beta Acids</b>	4 – 5% w/w
<b>Co-Humulone</b>	23 – 28% of alpha acids
<b>Storageability</b>	50 – 60% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.5 – 1.1 mls/100 grams
<b>Myrcene</b>	15 – 25% of whole oil
<b>Humulene</b>	18 – 25% of whole oil
<b>Caryophyllene</b>	10 -15% of whole oil
<b>Farnesene</b>	10 -15% of whole oil
<b>General Trade Perception</b>	Traditional, very fine or noble aroma hop
<b>Possible Substitutions</b>	US Saaz, US Tettnang, German Spalt Select
<b>Typical Beer Styles</b>	Lager, Pilsner, Bock, Alt, Kölsch, Munich Helles
<b>Additional Information</b>	Grown only in Spalt area and not a large acreage available.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR TETTANG

<b>Pedigree</b>	Traditional German variety developed in the area of the same name.
<b>Maturity</b>	Medium - early
<b>Yield</b>	1200 – 1600 kg./ha. or 1000 – 1400 lb./ac.
<b>Growth Habit</b>	Moderately vigorous but not prolific cone producer
<b>Disease/Pest Susceptibility</b>	Not resistant to German wilt strains. Some tolerance to downy mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-sized fairly tight cone
<b>Lupulin</b>	Moderate amount, golden yellow
<b>Aroma</b>	Mild and pleasant, slightly spicy
<b>Alpha Acids</b>	3.5 – 5.5% w/w
<b>Beta Acids</b>	3.5 – 5% w/w
<b>Co-Humulone</b>	23 – 29% of alpha acids
<b>Storageability</b>	55 – 60% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.6 – 1.0 mls/100 grams
<b>Myrcene</b>	20 – 25% of whole oil
<b>Humulene</b>	20 – 25% of whole oil
<b>Caryophyllene</b>	6 – 10% of whole oil
<b>Farnesene</b>	12 – 16% of whole oil
<b>General Trade Perception</b>	Traditional, very fine or noble aroma hop
<b>Possible Substitutions</b>	German Spalt, German Select, US Tettang, US Saaz, German Hersbrucker
<b>Typical Beer Styles</b>	Lager, Ale, Pilsner, Weizen, Lambic, Alt, Kölsch, Munich Helles
<b>Additional Information</b>	Largely confined to the Tettang area near Lake Constance.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### GR TRADITION

<b>Pedigree</b>	A close descendent of Hallertau Mittlefrüh, bred for disease resistance at the Hüll Hop Research Institute in Germany.
<b>Maturity</b>	Medium early
<b>Yield</b>	1750 – 2000 kg./ha. or 1560 – 1780 lb./ac.
<b>Growth Habit</b>	Vigorous grower with long laterals
<b>Disease/Pest Susceptibility</b>	Resistant to both Verticillium wilt and downy mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium-sized, quite tight cone
<b>Lupulin</b>	Moderate amount, pale yellow
<b>Aroma</b>	Very fine, similar to German Hallertau
<b>Alpha Acids</b>	5 – 7% w/w
<b>Beta Acids</b>	4 – 5% w/w
<b>Co-Humulone</b>	26 – 29% of alpha acids
<b>Storageability</b>	Good alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.0 – 1.4 mls/100 grams
<b>Myrcene</b>	20 – 25% of whole oil
<b>Humulene</b>	45 – 55% of whole oil
<b>Caryophyllene</b>	10 – 15% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Only recently released so too early for general consensus. Brew to replace Hersbrucker in German grown areas.
<b>Possible Substitutions</b>	Liberty, German Hallertau
<b>Typical Beer Styles</b>	Lager, Pilsner, Bock, Wheat, Weizen
<b>Additional Information</b>	Released in 1991 and undergoing expansion in German growing areas.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### NZ ORGANIC HALLERTAU

<b>Pedigree</b>	Triploid bred from Hallertau Mittlefrüh
<b>Maturity</b>	Early season
<b>Yield</b>	2650 kgs./ha. or 2336 lb./ac.
<b>Growth Habit</b>	Fairly vigorous
<b>Disease/Pest Susceptibility</b>	No real disease problems
<b>Pickability/Drying/Baling</b>	Normal
<b>Cone-Structure</b>	Dense cluster
<b>Lupulin</b>	Plentiful
<b>Aroma</b>	Nice resiny, citrusy characteristic
<b>Alpha Acids</b>	7 – 9% w/w
<b>Beta Acids</b>	6 – 6.5% w/w
<b>Co-Humulone</b>	35% of alpha acids
<b>Storageability</b>	Very good
<b>Total Oil</b>	0.9 – 1.1 mls/100 grams
<b>Myrcene</b>	45 – 48% of whole oil
<b>Humulene</b>	10 – 12% of whole oil
<b>Caryophyllene</b>	6% of whole oil
<b>Farnesene</b>	5% of whole oil
<b>General Trade Perception</b>	Commonly used for aroma variety.
<b>Possible Substitutions</b>	Unknown
<b>Typical Beer Styles</b>	Mainly used for organic beers
<b>Additional Information</b>	Available in limited quantities. New crop availability in March.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### NZ ORGANIC PACIFIC GEM

<b>Pedigree</b>	A triploid, high alpha variety released in 1987
<b>Maturity</b>	Early/Mid Season
<b>Yield</b>	2700 kg./ha. or 2380 lb./ac.
<b>Growth Habit</b>	Fairly vigorous
<b>Disease/Pest Susceptibility</b>	No real disease problems
<b>Pickability/Drying/Baling</b>	Normal
<b>Cone-Structure</b>	Medium-dense clusters
<b>Lupulin</b>	Plentiful
<b>Aroma</b>	Pleasant, blackberry aroma
<b>Alpha Acids</b>	14 – 16% w/w
<b>Beta Acids</b>	8 – 8.4% w/w
<b>Co-Humulone</b>	39% of alpha acids
<b>Storageability</b>	Very good
<b>Total Oil</b>	1.4% mls/100 grams
<b>Myrcene</b>	55% of whole oil
<b>Humulene</b>	18% of whole oil
<b>Caryophyllene</b>	7% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Widely used as a bittering hop. Woody flavor.
<b>Possible Substitutions</b>	Unknown
<b>Typical Beer Styles</b>	Organic Beers
<b>Additional Information</b>	Starting to see some limited use in the US. Considered to have some good future potential.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### AU PRIDE OF RINGWOOD

<b>Pedigree</b>	Second generation from the English-Pride of Kent. Bred in Australia.
<b>Maturity</b>	Mid-season – late variety
<b>Yield</b>	2200 – 2800 kg./ha. or 1950 – 2500 lb./ac.
<b>Growth Habit</b>	Good vigor, well hopped, and a nice grower-friendly hop
<b>Disease/Pest Susceptibility</b>	Downy mildew, powdery mildew, and aphids are absent from Australia, so its susceptibility to these is immaterial
<b>Pickability/Drying/Baling</b>	Excellent
<b>Cone-Structure</b>	Fairly long, quite tight cone
<b>Lupulin</b>	Moderate to large amount, medium dark yellow
<b>Aroma</b>	Quite pronounced but not unpleasant
<b>Alpha Acids</b>	7 – 10% w/w
<b>Beta Acids</b>	4 – 6% w/w
<b>Co-Humulone</b>	33 – 39% of alpha acids
<b>Storageability</b>	45 – 55% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.0 – 2.0 mls/100 grams
<b>Myrcene</b>	25 – 50% of whole oil
<b>Humulene</b>	3 – 8% of whole oil
<b>Caryophyllene</b>	5 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	Predominantly a bittering hop but with interesting aromatic qualities
<b>Possible Substitutions</b>	Galena, Cluster
<b>Typical Beer Styles</b>	Australian Lagers
<b>Additional Information</b>	At time of release in 1965, it was the highest alpha acid hop in the world and went on to become more than 90% of the Australian crop- closely associated with such famous beers as Foster's Lager.

**Personal Notes:**





## Hopunion CBS, LLC

### STYRIAN GOLDING

<b>Pedigree</b>	An ecotype of Fuggle grown in Slovenia. Also known as Savinja Golding
<b>Maturity</b>	Early maturing
<b>Yield</b>	1300 – 1700 kg./ha. or 1150 – 1500 lb./ac.
<b>Growth Habit</b>	Fairly neat, not prolific
<b>Disease/Pest Susceptibility</b>	Moderately resistant to downy mildew. Sensitive to aphids and mites.
<b>Pickability/Drying/Baling</b>	Fair to good
<b>Cone-Structure</b>	Medium-compact, fairly small tight cone
<b>Lupulin</b>	Moderate amount, pale yellow
<b>Aroma</b>	Delicate, slightly spicy
<b>Alpha Acids</b>	4.5 – 6% w/w
<b>Beta Acids</b>	2 – 3% w/w
<b>Co-Humulone</b>	25 – 30% of alpha acids
<b>Storageability</b>	65 – 80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.5 – 1.0 mls/100 grams
<b>Myrcene</b>	27 – 33% of whole oil
<b>Humulene</b>	34 – 38% of whole oil
<b>Caryophyllene</b>	9 – 11% of whole oil
<b>Farnesene</b>	2 – 5% of whole oil
<b>General Trade Perception</b>	A world-renowned aroma hop with widespread usage in both ale and lager brewing.
<b>Possible Substitutions</b>	US Fuggle, Willamette, UK Fuggle
<b>Typical Beer Styles</b>	English style Ale, ESB, Lager, Pilsner, Belgian-Style Ales
<b>Additional Information</b>	The old traditional favorite of Slovenia. Also well-established in English brewing as Fuggle.
<b>Personal Notes:</b>	



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### UK CHALLENGER

<b>Pedigree</b>	A granddaughter of Northern Brewer bred in England with German downy mildew resistant males.
<b>Maturity</b>	Late season
<b>Yield</b>	1600 – 2000 kg./ha. or 1400 – 1800 lb./ac.
<b>Growth Habit</b>	Beautiful neat columnar habit with even laterals, good head, and nicely hopped down.
<b>Disease/Pest Susceptibility</b>	Bred for resistance to downy mildew and some strains of powdery mildew. Sensitive to Verticillium wilt.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Good sized fairly firm cone
<b>Lupulin</b>	Moderate to copious amounts, mid-yellow
<b>Aroma</b>	Mild to moderate, quite spicy
<b>Alpha Acids</b>	6.5 – 8.5% w/w
<b>Beta Acids</b>	4 – 4.5% w/w
<b>Co-Humulone</b>	20 – 25% of alpha acids
<b>Storageability</b>	70 – 85% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.0 – 1.7 mls/100 grams
<b>Myrcene</b>	30 – 42% of whole oil
<b>Humulene</b>	25 – 32% of whole oil
<b>Caryophyllene</b>	8 – 10% of whole oil
<b>Farnesene</b>	1 – 3% of whole oil
<b>General Trade Perception</b>	One of the few recognized dual-purpose hops combining moderate amounts of alpha acids with a good kettle hop aroma
<b>Possible Substitutions</b>	US or German Perle, Northern Brewer
<b>Typical Beer Styles</b>	English style Ale, Porter, Stout, ESB, Bitter, Barley Wine, Brown Ales
<b>Additional Information</b>	A result of Wye's efforts to combine higher levels of alpha acids with technically good aroma, disease resistance, and good agronomic properties. Released in 1968.

**Personal Notes:**



## Hopunion CBS, LLC

### UK FIRST GOLD

<b>Pedigree</b>	A cross-pollination of Whitbread Golding variety and a dwarf male
<b>Maturity</b>	Mid-season
<b>Yield</b>	1300 – 1900 kg./ha. or 1100 – 1700 lb./ac.
<b>Growth Habit</b>	Dwarf, short laterals, very well hopped down
<b>Disease/Pest Susceptibility</b>	Resistant to powdery mildew, moderate resistance to Verticillium wilt, susceptible to downy mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Good size firm cones
<b>Lupulin</b>	Plentiful
<b>Aroma</b>	A little like Golding, spicy
<b>Alpha Acids</b>	6.5 – 8.5% w/w
<b>Beta Acids</b>	3 – 4% w/w
<b>Co-Humulone</b>	31 – 36% of alpha acids
<b>Storageability</b>	Very good
<b>Total Oil</b>	0.7 – 1.5 mls/100 grams
<b>Myrcene</b>	27 – 28% of whole oil
<b>Humulene</b>	20 – 24% of whole oil
<b>Caryophyllene</b>	6 – 7% of whole oil
<b>Farnesene</b>	3% of whole oil
<b>General Trade Perception</b>	First commercial dwarf hop designed for aroma consideration in England, a very promising hop.
<b>Possible Substitutions</b>	UK Kent Golding, maybe Crystal
<b>Typical Beer Styles</b>	Ale, ESB
<b>Additional Information</b>	Early brewing trials look very favorable, limited acreage
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### UK FUGGLE

<b>Pedigree</b>	A chance seedling raised in England at about the turn of the century.
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1200 – 1500 kg./ha. or 1050 – 1350 lb./ac.
<b>Growth Habit</b>	Neat habit, fairly prolific, good grower hop
<b>Disease/Pest Susceptibility</b>	Some resistance to downy mildew. Sensitive to Verticillium wilt.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium small, quite light cone
<b>Lupulin</b>	Moderate amounts, mid-yellow
<b>Aroma</b>	Mild, pleasant and hoppy
<b>Alpha Acids</b>	4 – 5.5% w/w
<b>Beta Acids</b>	2 – 3% w/w
<b>Co-Humulone</b>	23 – 30% of alpha acids
<b>Storageability</b>	70 -80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.7 – 1.4 mls/100 grams
<b>Myrcene</b>	24 – 28% of whole oil
<b>Humulene</b>	35 – 40% of whole oil
<b>Caryophyllene</b>	11 – 13% of whole oil
<b>Farnesene</b>	5 – 7% of whole oil
<b>General Trade Perception</b>	A hop long associated with typical English Ale brewing. Imparts good hoppy late-hop flavor
<b>Possible Substitutions</b>	US Fuggle, Willamette, Styrian Golding
<b>Typical Beer Styles</b>	All English style Ales, ESB, Bitter, Lager, and Lambic
<b>Additional Information</b>	Once a predominant hop in England but now reserved for aroma use in conjunction with high alpha types.

**Personal Notes:**



## Hopunion CBS, LLC

### UK KENT GOLDING

<b>Pedigree</b>	The Goldings are the traditional Old English hop. Develops by clonal selection from 1790 on starting from Canterbury Whitebine.
<b>Maturity</b>	Early mid and late maturing sub-varieties exist
<b>Yield</b>	1500 – 1800 ka./ha. or 1350 – 1600 lb./ac.
<b>Growth Habit</b>	Ranges from vigorous growth types to fewer strong forms
<b>Disease/Pest Susceptibility</b>	Sensitive to downy mildew. As a group the Goldings are unique in their high level of sensitivity to Hop Mosaic Virus.
<b>Pickability/Drying/Baling</b>	Tendency to shatter especially if too dry
<b>Cone-Structure</b>	Fairly loose and lax, medium to large in size
<b>Lupulin</b>	Quite small amounts, pale yellow in color
<b>Aroma</b>	Gentle, fragrant and pleasant
<b>Alpha Acids</b>	4 – 5.5% w/w
<b>Beta Acids</b>	2 – 3.5% w/w
<b>Co-Humulone</b>	20 – 25% of alpha acids
<b>Storageability</b>	65 – 80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.6 – 1.0 mls/100 grams
<b>Myrcene</b>	20 – 26% of whole oil
<b>Humulene</b>	42 – 48% of whole oil
<b>Caryophyllene</b>	12 – 16% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	The classic English Ale hop which has been used extensively in kettle hopping and for dry hopping.
<b>Possible Substitutions</b>	US Golding, Whitbread Golding, UK Progress
<b>Typical Beer Styles</b>	All English style Ales, Belgian-Style Ales
<b>Additional Information</b>	Traded as East-Kent Goldings, if grown in East Kent, Kent Goldings if grown in mid-Kent, and Goldings if grown elsewhere.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### UK NORTHDOWN

<b>Pedigree</b>	A first generation selection from Northern Brewer crossed with a German male resistant to downy mildew
<b>Maturity</b>	Early to mid-season
<b>Yield</b>	1500 – 1900 kg./ha. or 1350 – 1700 lb./ac.
<b>Growth Habit</b>	Not over-vigorous, neat and manageable
<b>Disease/Pest Susceptibility</b>	Susceptible to Verticillium wilt and powdery mildew but quite resistant to downy mildew
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Medium to large, plumpish, quite loose
<b>Lupulin</b>	Moderate amounts, palish yellow
<b>Aroma</b>	Mild, pleasant and delicate hop aroma
<b>Alpha Acids</b>	7.5 – 9.5% w/w
<b>Beta Acids</b>	5 – 5.5% w/w
<b>Co-Humulone</b>	24 – 30% of alpha acids
<b>Storageability</b>	60 – 70% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.5 – 2.5 mls/100 grams
<b>Myrcene</b>	23 – 29% of whole oil
<b>Humulene</b>	40 – 45% of whole oil
<b>Caryophyllene</b>	13 – 17% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A true dual-purpose hop with moderate bittering potential and excellent flavor/aroma characteristics.
<b>Possible Substitutions</b>	UK Challenger, Northern Brewer
<b>Typical Beer Styles</b>	All Ales, Porter
<b>Additional Information</b>	Released in early 1970's with relatively high alpha acids for its time. Its excellent flavor properties ensured its continued survival after the release of the higher alpha acids variety Wye Target.
<b>Personal Notes:</b>	



## Hopunion CBS, LLC

### UK PROGRESS

<b>Pedigree</b>	A daughter of Whitbread's Golding variety (WGV1147) bred with wild American germplasm on the male side.
<b>Maturity</b>	Mid-season
<b>Yield</b>	1800 – 2300 kg./ha. or 1600 – 2050 lb./ac.
<b>Growth Habit</b>	Strong grower, dark in color, prolific cone producer
<b>Disease/Pest Susceptibility</b>	Bred for tolerance to Verticillium wilt. Susceptible to downy mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Good-sized, firm, plump cone
<b>Lupulin</b>	Moderate amounts, fairly dark yellow in color
<b>Aroma</b>	Moderately strong, good aroma
<b>Alpha Acids</b>	5 – 7% w/w
<b>Beta Acids</b>	2 – 2.5% w/w
<b>Co-Humulone</b>	25 – 30% of alpha acids
<b>Storageability</b>	60 – 80% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	0.6 – 1.2 mls/100 grams
<b>Myrcene</b>	30 – 35% of whole oil
<b>Humulene</b>	40 – 47% of whole oil
<b>Caryophyllene</b>	12 – 15% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A robust hop aroma type with moderate bittering potential.
<b>Possible Substitutions</b>	UK Kent Golding, Fuggle
<b>Typical Beer Styles</b>	Ale, Bitter, ESB, Porter
<b>Additional Information</b>	One of the very few aroma hops actually purpose-bred in a modern breeding program. Released in the mid-sixties just before brewer demand switched to high alpha acids so it never become very widely planted.

**Personal Notes:**



## Hopunion CBS, LLC

### UK TARGET

<b>Pedigree</b>	A second generation selection from Northern Brewer by a male seedling of English Goldings.
<b>Maturity</b>	Late season
<b>Yield</b>	1500 – 2000 kg./ha. or 1350 – 1800 lb./ac.
<b>Growth Habit</b>	Difficult to train but then quite vigorous and high yielding
<b>Disease/Pest Susceptibility</b>	Tolerant to Verticillium wilt and resistant to powdery mildew. Sensitive to downy mildew.
<b>Pickability/Drying/Baling</b>	Good
<b>Cone-Structure</b>	Smallish plump, but very tight cone
<b>Lupulin</b>	Abundant and medium yellow in color
<b>Aroma</b>	Pleasant English hop aroma, quite intense
<b>Alpha Acids</b>	9.5 – 12.5% w/w
<b>Beta Acids</b>	5 – 5.5% w/w
<b>Co-Humulone</b>	29 – 35% of alpha acids
<b>Storageability</b>	45 – 55% alpha acids remaining after 6 months storage at 20° C
<b>Total Oil</b>	1.6 – 2.6 mls/100 grams
<b>Myrcene</b>	45 – 55% of whole oil
<b>Humulene</b>	17 – 22% of whole oil
<b>Caryophyllene</b>	8 – 10% of whole oil
<b>Farnesene</b>	<1% of whole oil
<b>General Trade Perception</b>	A good high alpha variety with an acceptable to desirable kettle hop aroma.
<b>Possible Substitutions</b>	Fuggle, Willamette
<b>Typical Beer Styles</b>	All Ales and Lagers
<b>Additional Information</b>	The predominant UK variety at present and widely used for its high alpha acids content combined with an acceptable aroma. Normally used for bittering.
<b>Personal Notes:</b>	