

Hops	Aroma	Alpha Acids (w/w)	Storageability (% alpha acids remaining after 6 months storage at 20°C)	General Trade Perception	Possible Substitutions	Typical Beer Styles	Additional Information
AHTANUM (US)	Floral	5.7 – 6.3%	Fair to good	Used for its aromatic properties and moderate bittering	Cascade, Amarillo	Lager, American Ales	Quite similar to Cascade
AMARILLO (US)	Floral and citrusy	8 – 11%	Average	Gaining acceptance, viewed somewhat as a Cascade type	Cascade, Centennial, possibly Chinook or Ahtanum	American Ales, IPA	Very limited acreage at this time.
BREWER'S GOLD (US)	Blackcurrant, fruity, spicy	8 – 10%	Poor	Mainly used as a bittering hop	Bullion	Ale, Pilsners & Lambic	Limited acreage in the US
CASCADE (US)	Flowery and citrusy. Can have a grapefruit note.	4.5 – 7.0%	48 – 52%	Aroma variety with well-balanced bittering It is the most popular hop with the craftbrewing industry. Good for dry hopping.	Centennial, Amarillo, to a lesser extent, Columbus	American-Style Ales, especially Pale Ale, Porter, Barley wines; Can also be used in Witbier.	Released in 1972 and well-established in US industry. The first commercially accepted American-bred aroma hop.
CENTENNIAL (US)	Medium intensity with floral and citrus tones	9.5 – 11.5%	60 – 65%	Very balanced hop, sometimes called a super cascade.	Cascade, possibly Columbus or Chinook. a blend of 70% Cascade and 30% Columbus will give similar profile.	All US Ale styles, has been used with US Wheat	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.
CHINOOK (US)	Medium intensity, spicy, piney, distinctive grapefruit	12.0 – 14.0%	65 – 70%	A high alpha-acids hop with an acceptable aroma profile.	Nugget, Columbus, Northern Brewer, Wye Target, possibly Centennial	US Style Pale Ale, IPA, Stout, Porter, Barley Wine, Lager (Bittering)	Released in the US industry in 1985 and becoming increasingly popular with craft-brewers.
CLUSTER (US)	Floral and spicy	5.5 – 8.5%	80 – 85%	An excellent general purpose hop with medium and balanced bittering potential and <u>no undesirable aroma properties</u> .	Galena, possibly US Northern Brewer	Ale (Aroma), Lager (Bittering), Stout	For years the standard US cultivar, improved mass selection in the mid-sixties. Limited acreage grown today.
COLUMBUS (US)	Pungent	14 – 16%	Below average	Originally bred for its alpha value, it has also become popular for its oil profile. Great for dry hopping.	Nugget, Chinook, Wye Target, Northern Brewer, possibly Centennial	US IPA, US Pale Ale, Stout, Barley Wine, Lager (Bittering)	Also know as Tomahawk. Considered similar to Zeus.
CRYSTAL (US)	Mild, spicy & flowery	3.5 – 5.5%	50%	Very popular in the craft-brewing industry. Viewed the most pungent of the new triploid Hallertau family of hops.	Mt. Hood, Hersbruck, French Strisselspalt, Liberty, Hallertau	Pilsner, Lager, Kölsch, ESB, Alt, Belgian-Style Ales	Primarily grown in Oregon. Acreage is increasing in the 1990's.

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FUGGLE (US)	Mild, woody and fruity	4.0 – 5.5%	60 – 65%	Traditional English-type aroma hop	UK Fuggle, Willamette, Styrian Golding, US Tettnang	Any English-style beer or American Ales, Lambic	Also know 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.
GALENA (US)	Citrusy	12 – 14%	75 – 80%	An excellent high alpha acids hop with balanced bittering properties combined with a good aroma profile.	Nugget	Can be used in most English-style and American ales	Released in 1978.
GLACIER (US)	Excellent, pleasant hoppiness	5.50%	Good	An excellent new variety with balanced bittering properties combined with a good aroma profile.	Willamette, US Fuggle, US Tettnang, Styrian Golding	Pale Ale, ESB, Bitter, English-Style Pale Ale, Porter, Stout	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.
GOLDING (US)	Mild, delicate classic English-type	4.0 – 5.0%	65 – 80%	US Goldings are very popular among ale breweries in the US	UK East Kent Golding, UK Progress and possibly the Fuggle family	All English-style beers, especially all Bitters and Pale Ale, Belgian-Style Ales, Barley Wine	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.
HALLERTAU (US)	Very mild, slightly flowery and somewhat spicy	3.5 – 5.5%	52 – 58%	Traditional German aroma hop	Liberty, German Hallertau, German Tradition	Lager, Pilsner, Bock, Wheat, Kölsch, Munich Helles, Belgian-Style Ales	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!
HORIZON (US)	Floral, spicy	11 – 13%	Average to good	Good potential as a medium alpha, good aroma, purpose hop. Has a low cohumulone, which results in a clean tasting beer.	Magnum	All Ales and Lagers	Commercially grown in small quantities. Gaining in popularity with the craft-brewing industry.
LIBERTY (US)	Mild with a slightly spicy character	3.0 – 5.0%	35 – 55%	Aroma variety with close similarities to imported German aroma varieties, especially Hallertau.	US or German Hallertau, German Tradition, Mt Hood, possibly Spalt	Lager, Pilsner, Bock, US Wheat, Kölsch	Released in the US in 1991. Of the four triploid Hallertau varieties released, Liberty most closely resembles the Hallertau cultivar.

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MAGNUM (US)	No real distinct aroma character, so is viewed favorably as a clean bittering hop	12 – 14%	Very good	Gaining increasing acceptance as a clean bittering hop.	German Magnum, possibly Horizon	Good bittering hop for all Ales and Lagers	Limited acreage in the US, but widely grown in Germany.
MILLENIUM (US)	Mild, Herbal, similar to Nugget	15.50%	24%	Very new hop. Primarily used for alpha potential	Nugget and Columbus	Ales, Stout, Barley Wine	Released by John I Haas
MOUNT HOOD (US)	Mild, somewhat pungent	5.0 – 8.0%	50 -60%	Aroma variety with marked similarities to the Hallertauer and Herbrucker varieties. Most popular hop in the triploid Hallertau breeding program, partly due to the fact it was the first one released.	Crystal, French Strisselspalt, Herbrucker	Lager, Pilsner, Bock, US Wheat, Alt, Munich Helles	Released in the US in 1989.
NEWPORT (US)	Mild	13.5 – 17%	36 – 38%	Viewed as a high-bittering alpha hop.	Galena, Nugget, Fuggie, Magnum, Brewer's Gold	Ales, Stout, Barley Wine	One of the newest varieties to be released in the US (Year 2002)
NORTHERN BREWER (US)	Medium -strong	8 – 10%	70 – 85%	A true dual-purpose hop, containing moderate of alpha acids combined with a good aroma profile.	German Northern Brewer, Chinook	All English-styles, especially Porter, American Ales, Kölsch, Munich Helles	A major alpha hop in Germany, but declining in areas in England. Limited acreage in the US.
NUGGET (US)	Herbal	12 – 14%	70 – 80%	A high alpha acids hop with a good aroma profile.	Galena, Magnum, Columbus, Wye Target	Ales, Stout, Barley Wine	Released in 1982 and now a major high alpha acids variety in the US. Also grown in Germany.
PERLE (US)	Floral and slightly spicy	7 – 9.5%	80 – 85%	A hop with German type aroma properties combines with moderate bittering potential. A dual purpose hop. Popular with craft-brewers.	German Perle, German and US Northern Brewer	Pale Ale, Porter, Stout, Lager, Weizen, Alt, Barley Wine, Kölsch	Excellent storagability.

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SAAZ (US)	Very mild, spicy and earthy	3.0 – 4.5%	45 – 55%	Available in small quantities.	Czech Saaz, Polish Lublin, Sterling	Pilsner, Lager, US Wheat, Belgian-Style Ales, Bitter	High ambient temperatures can have an adverse effect on yields.
SANTIAM (US)	Floral, slightly spicy	5 – 7%	Average	A newly developed American aroma hop that contains noble hop characteristics.	German Tettnang, German Spalt, German Spalter Select	Lager, US Ales, Pilsner, Belgian Tripel and other Belgian-Styles, Kölsch, Bock, Munich Helles	Limited but stable acreage.
SIMCOE (US)	Very unique, pine-like aroma	12 – 14%	Good	Used for aromatic, and especially bittering properties	Unknown	American Ales	Known as a bittering hop with good aroma characteristics
STERLING (US)	Herbal, spicy with a hint of floral and citrus	6 – 9%	Good	Perceived to be similar to a Saaz and Mt Hood combination. Finding favor as a Saaz replacement.	Czech Saaz	Pilsner and other Lagers, Ales and Belgian-Style Ales	Limited, but stable acreage.
TETTNANG (US)	Slightly spicy	4.0 – 5.0%	55 – 60%	A true noble aroma variety	German Spalt Select, German Spalt, Santiam	Lager, US Ales, Pilsner, US Wheat, Bitter	US Tettnang is similar to Fuggle. A very popular hop with the craft-brewery industry.
VANGUARD (US)	Similar to Hallertau.	5.5% - 6%	75 – 80%	Still being tested and looked at by micro & craft breweries.	Hallertau, German Hersbrucker, Mt Hood, Liberty	Lager, Pilsner, Bock, Kölsch, Wheat, Munich Helles, Belgian-Style Ales	Similar to Hallertau Mittlefruh
WARRIOR (US)	Very mild	15 – 17%	Good	New hop with much potential. Very stable.	Nugget, Columbus	Pale Ale, IPA	Very grower friendly
WILLAMETTE (US)	Mild and pleasant, slightly spicy	4.0 – 6.0%	60 – 65%	A quality aroma hop	US Fuggle, US Tettnang, Styrian Golding	All English-style Ales, and US Pale and Brown Ales.	Released in 1976 and well-established in the US industry. Currently the most widely grown aroma hops in the US.

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CZECH SAAZ	Very mild with pleasant hoppy notes	3 – 4.5%	45 – 55%	The classical "noble" aroma hop with long and strong traditions. Associated with the renowned Pilsner lager.	US Saaz, Polish Lublin, US Sterling	Pilsner, Lagers, Belgian-Style Ales, Lambic, sometimes Bitter	By far the predominant Czech variety and clones of it are grown in Poland and the Ukraine.
FRENCH STRISSELSPALT	Medium intensity, pleasant and hoppy	3 – 5%	60 – 70%	Good to very good aroma hop	Mt Hood, Crystal, Hersbruck	Pilsner, Lager, Wheat	Well accepted as good aroma hop around the world. Similar to Hersbruck in profile but preferred by some breweries.
BREWER'S GOLD (GR)	Black currant, fruity, spicy	5.5 – 6.5%	Average	Mainly used as a bittering hop	UK Northdown, Northern Brewer, Galena, Bullion, US Brewer's Gold	Ale, heavier German style Lagers, Lambic	Originally bred in the UK by Professor E.S. Salmon
HALLERTAU (GR)	Mild and pleasant	3.5 – 5.5%	50 – 60%	The classic German aroma hop associated with Bavarian style lager beers.	Liberty, German Tradition, Ultra	Lager, Bock, Pilsner, Weizen, Belgian-Style Ales, Alt, Lambic, Kölsch, Munich Ales	Limited areas grown in the US, tends to grow best in the milder climates of Oregon and northern Idaho.
HERSBRUCKER (GR)	Mild to semi-strong, pleasant and hoppy	3 – 5.5%	55 – 65%	Good to very good aroma hop.	Mt Hood, French Strisselspalt	Lager, Pilsner, Bock, Weizen Bock, Wheat, Belgian-Style Ales, Kölsch, Munich Helles	Grown widely not only in the Hallertau but also in Spalt and Hersbruck areas.
MAGNUM (GR)	No real distinct aroma character, so is viewed favorably as a clean bittering hop	12 – 14%	Very good	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.	Columbus, Nugget	Lagers, Pilsner types, Stout, Ales. Typically base bitterness in Lager beers (commonly used as a first hop addition) and at	Hallertau Magnum is the second largest hop variety and the main high alpha variety grown in Germany.
NORTHERN BREWER (GR)	Medium-strong with some wild American tones	7 – 10%	70 – 80%	A true dual-purpose hop containing moderate amounts of alpha acids combined with an acceptable aroma profile.	Chinook, US Northern Brewer, German Brewer's Gold	ESB, Bitter, English Pale Ale, Porter, Lager, Lambic, Munich Helles	Although declining in area in England, this variety is one of the main high-alpha hops in Germany.
PERLE (GR)	Moderately intense, good and hoppy	6 – 8%	70 -80%	A well accepted dual-purpose hop with a good combination balanced bittering and highly acceptable aroma properties	US Perle, Northern Brewer	Pale Ale, Porter, Stout, Lager, Pilsner, Weizen, Ale, Alt, Kölsch, Munich Helles	Introduced in the 1980's and grown in both Washington and Oregon states. Perle is the most popular German-grown hop variety.

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SELECT (GR)	Very fine Spalter type aroma	4 – 6%	Good	Too early for general consensus but bred to be like the Spalt/Tettnang/Saaz group	US Saaz, US Tettnang, German Spalt, German Tettnang, German Hersbrucker	Lager, any beer where noble aroma is wanted (i.e. Pilsner)	Released in 1991 and seeing some limited expansion in German growing areas.
SPALT (GR)	Mild and pleasant, slightly spicy	4 – 5%	50 – 60%	Traditional, very fine or noble aroma hop	US Saaz, US Tettnang, German Spalt Select	Lager, Pilsner, Bock, Alt, Kölsch, Munich Helles	Grown only in Spalt area and not a large acreage available.
TETTNANG (GR)	Mild and pleasant, slightly spicy	3.5 – 5.5%	55 – 60%	Traditional, very fine or noble aroma hop	German Spalt, German Select, US Tettnang, US Saaz, German Hersbrucker	Lager, Ale, Pilsner, Weizen, Lambic, Alt, Kölsch, Munich Helles	Largely confined to the Tettnang area near Lake Constance.
TRADITION (GR)	Very fine, similar to German Hallertau	5 – 7%	Good	Only recently released so too early for general consensus. Brew to replace Hersbrucker in German grown areas.	Liberty, German Hallertau	Lager, Pilsner, Bock, Wheat, Weizen	Released in 1991 and undergoing expansion in German growing areas.
ORGANIC HALLERTAU (NZ)	Nice resin, citrusy characteristic	7 – 9%	Very good	Commonly used for aroma variety.	Unknown	Mainly used for organic beers	Available in limited quantities. New crop availability in March.
ORGANIC PACIFIC GEM (NZ)	Pleasant, blackberry aroma	14 – 16%	Very good	Widely used as a bittering hop. Woody flavor.	Unknown	Organic Beers	Starting to see some limited use in the U.S. Considered to have some good future potential.
PRIDE OF RINGWOOD (AU)	Quite pronounced but not unpleasant	7 – 10%	45 – 55%	Predominantly a bittering hop but with interesting aromatic qualities	Galena, Cluster	Australian Lagers	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.
STYRIAN GOLDING	Delicate, slightly spicy	4.5 – 6%	65 – 80%	A world-renowned aroma hop with widespread usage in both ale and lager brewing.	US Fuggle, Willamette, UK Fuggle	English style Ale, ESB, Lager, Pilsner, Belgian- Style Ales	The old traditional favorite of Slovenia. Also well-established in English brewing as Fuggle.
CHALLENGER (UK)	Mild to moderate, quite spicy	6.5 – 8.5%	70 – 85%	One of the few recognized dual-purpose hops combining moderate amounts of alpha acids with a good kettle hop aroma	US or German Perle, Northern Brewer	English style Ale, Porter, Stout, ESB, Bitter, Barley Wine, Brown Ales	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.
FIRST GOLD (UK)	A little like Golding, spicy	6.5 – 8.5%	Very good	First commercial dwarf hop designed for aroma consideration in England, a very promising hop.	UK Kent Golding, maybe Crystal	Ale, ESB	Early brewing trials look very favorable, limited acreage

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FUGGLE (UK)	Mild, pleasant and hoppy	4 – 5.5%	70 -80%	A hop long associated with typical English Ale brewing. Imparts good hoppy late-hop flavor	US Fuggle, Willamette, Styrian Golding	All English style Ales, ESB, Bitter, Lager, and Lambic	Once a predominant hop in England but now reserved for aroma use in conjunction with high alpha types.
KENT GOLDING (UK)	Gentle, fragrant and pleasant	4 – 5.5%	65 – 80%	The classic English Ale hop which has been used extensively in kettle hopping and for dry hopping.	US Golding, Whitbread Golding, UK Progress	All English style Ales, Belgian-Style Ales	Traded as East-Kent Goldings, if grown in East Kent, Kent Goldings if grown in mid-Kent, and Goldings if grown elsewhere.
NORTHDOWN (UK)	Mild, pleasant and delicate hop aroma	7.5 – 9.5%	60 – 70%	A true dual-purpose hop with moderate bittering potential and excellent flavor/aroma characteristics.	UK Challenger, Northern Brewer	All Ales, Porter	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.
PROGRESS (UK)	Moderately strong, good aroma	5 – 7%	60 – 80%	A robust hop aroma type with moderate bittering potential.	UK Kent Golding, Fuggle	Ale, Bitter, ESB, Porter	One of the very few aroma hops actually purposebred 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.
TARGET (UK)	Pleasant English hop aroma, quite intense	9.5 – 12.5%	45 – 55%	A good high alpha variety with an acceptable to desirable kettle hop aroma.	Fuggle, Willamette	All Ales and Lagers	The predominant UK variety at present and widely used for its high alpha acids content combined with an acceptable aroma. Normally used for bittering.
LUBLIN (PO)	Mild and typical of noble aroma types	3.0 - 4.5%	40 - 55%	Traditional aroma hop			More freely available on the world market since opening of the former Eastern bloc. A landrace aroma variety grown in the area of the same name and widely believed to be a clonal selection of Saaz.
MARYNKA (PO)	Intensive	9.0 - 12.0%					
STYRIAN GOLDINGS (SLOVENIAN)	Delicate, slightly spicy	4.5 - 6.0%	65 - 80%	A world-renowned aroma hop with widespread usage in both ale and lager brewing.	U.S. Fuggle, U.K. Fuggle, Willamette	All English-style ales, ESB, bitter, lager	An ecotype of Fuggle grown in Slovenia. Also known as Savinja Golding. The old traditional favorite of Slovenia. Also well-established in English brewing as Fuggle.
SUPER STYRIANS (SLOVENIAN)	Quite mild, hoppy, pleasant	7.0 - 9.0%		A good dual-purpose variety contributing moderate levels of bittering coupled with pleasant European aroma.			A trade name for dual-purpose varieties from Slovenia. The principal variety is Aurora - a seedling of Northern Brewer. Varieties established in Slovenia since the early 1970's and now with good acceptance in the world hop trade.
ADMIRAL (UK)	Used for it's bittering potential; Displays a typical English aroma	13.0 - 16.0%		Looks to be good replacement for high alpha and dual purpose hops for brewing; Admiral is seen as a replacement to Wye Target.	U.K. Target, U.K. Northdown, U.K. Challenger	Ale	Bred at Wye College in England, granddaughter of Wye Challenger. Being grown for its high cropping and alpha yield.

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BRAMLING CROSS (UK)	Quite mild and not unpleasant	5.0 - 7.8%	60 - 70%	Acceptable general purpose aroma hop but lacking the fineness of Golding aroma.	U.K. Kent Golding, U.K. Progress, Whitbread Golding Variety	ESB, bitter, pale ale	Raised in 1927 from the commercial Golding variety Bramling crossed with a Manitoban wild male hop. Its tolerance to Verticillium wilt allowed its expansion in the U.K. as the acreage of Fuggles and Goldings declined.
BULLION (UK)		8 - 11%			Brewer's Gold, Pacific Gem	bittering hop for British ales, perhaps some finishing	Bullion was raised in 1919 Engand from a wild Manitoban female crossed with and English male hop. It's considered a dual-purpose hop, but is generally used for bittering. It has an intense aroma, reminiscent of black currants. It is gradually losing ground to the new higher alpha hops with better storage properties.
EROICA (UK)	Clean	12 - 14%			Northern Brewer, Galena	Dark English ales	
PHOENIX (UK)	Similar to Wye Challenger	9.0 - 13.5%	Very good	Phoenix has all the characteristics of an English dual purpose variety similar to Wye Challenger	U.K. Northdown, U.K. Kent Golding, U.K. Challenger	Ale	Phoenix is the most Wilt tolerant hop variety currently in production, this, coupled with its alpha and aroma properties makes it a useful hop for brewers and growers alike.
PILGRIM (UK)		9-13%					In brewing trials Pigrim has performed well as a replacement for high alpha or dual purpose hops. Because of its alpha it has been compared to Target more than any other variety. It has however a much hoppier aroma than Target due to its higher levels of Humulene and Challenger-like Selinene levels. From early storage trials stability of the alpha acids in Pilgrim seem to be excellent.
PIONEER (UK)	A mild typical English aroma	8.0 - 10.0%	Good	A semi-dwarf hop as yet not widely grown. It is limited brewing trials suggest that this is a good dual purpose variety.	U.K. Kent Golding	Ale, ESB	Although this hop is classified as a dwarf variety it does not display all the characteristics associated with dwarfness and may grow better on low trellis, 10 foot wire work. Very limited acreage