

## *Hops*

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Name	Alpha Acid %	Typical Beer Styles	Possible Substitutions	Flavor Description
<b>Admiral (U.K.)</b>	13.5% to 16%	Ale	U.K. Target, U.K. Northdown, U.K. Challenger	Known for its bittering potential.
<b>Ahtanum</b>	4% to 6.3%			Floral, citrus, sharp, and piney.
<b>Amarillo</b>	8% to 9%	Ale, IPA	Cascade, Centennial	Citrusy, flowery.
<b>Bramling Cross (U.K.)</b>	5% to 7%	ESB, bitter, pale ale	U.K. Kent Golding, U.K. Progress, Whitbread Golding Variety	Quite mild, fruity currant aroma.
<b>Brewer's Gold</b>	7% to 8.5%	English ale	Bullion	Bittering hop with neutral aroma character.
<b>Brewer's Gold (German)</b>	6% to 7%	Ale, heavier German-style lagers	Northdown, Northern Brewer, Galena, Bullion	Black currant, fruity, spicy.
<b>Bullion</b>	6.5% to 9%	IPA, ESB, stout	Columbus, Northern Brewer, German Brewer's Gold	A rich hop primarily used for bittering. Intense blackcurrant aroma.
<b>Cascade</b>	4.5% to 7%	Pale ale, IPA, porter, barleywine	Centennial, Amarillo, possibly Columbus	Pleasant, flowery, spicy, and citrusy. Can have a grapefruit flavor.
<b>Centennial</b>	8% to 11.5%	All ale styles, has been used with wheat beer	Cascade, possibly Columbus	Medium with floral and citrus tones.
<b>Challenger (U.K.)</b>	6.5% to 8.5%	English-style ales, porter, stout, ESB, bitter	U.S. or German Perle, Northern Brewer	Mild to moderate, quite spicy.
<b>Chinook</b>	10% to 14%	Pale ale, IPA, stout, porter, lager	Nugget, Columbus, Northern Brewer, U.K. Target	Mild to medium-heavy, spicy, piney, and grapefruity.
<b>Cluster</b>	5.5% to 8.5%	Ale and lager (good aroma for ale, good bittering for lager)	Galena	Medium and quite spicy.
<b>Columbus</b>	11% to 16%	IPA, pale ale, stout	Nugget, Chinook, U.K. Target, Northern Brewer	Pleasant, with pungent aroma.
<b>Crystal</b>	2% to 4.5%	Lager, pilsner, ESB	Mt. Hood, Hersbrucker, French Strisslespalt, Liberty, Hallertauer	Mild and pleasant, spicy and flowery.
<b>Eroica</b>	9% to 12%	Wheat	Galena, Nugget, Chinook	Strong but pleasant aroma.
<b>First Gold (U.K.)</b>	6.5% to 8.5%	Ale, ESB	U.K. Kent Golding, maybe Crystal	A little like Golding family; spicy.
<b>Fuggle (U.S.)</b>	4% to 5.5%	Any English-style beer or American ale	U.K. Fuggle, Willamette, Styrian Golding, U.S. Tettnanger	Mild and pleasant, earthy and fruity.
<b>Fuggle (U.K.)</b>	4% to 5.5%	All English-style ales, ESB, bitter, lager	U.S. Fuggle, Willamette, Styrian Golding	Mild, pleasant, hoppy, and robust.
<b>Galena</b>	10% to 14%	Ale, porter, stout, ESB, bitter	Nugget, Pride of Ringwood, Chinook	Medium but pleasant hoppiness, citrusy.
<b>Golding (U.S.)</b>	4% to 6%	Pale ale, ESB, all English-style beer	U.K. Golding, Whitbread Golding Variety, U.K. Progress, and possibly the Fuggle family	Mild, extremely pleasant, and gently hoppy.
<b>Hallertauer (U.S.)</b>	3.5% to 5.5%	Lager, pilsner, bock, wheat	Liberty, Ultra, Hallertauer Tradition	Very mild, pleasant, and slightly flowery, some spicy.
<b>Hallertauer Gold</b>	6% to 6.5%		Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
<b>Hallertauer Mittelfrüh</b>	3% to 5.5%	Lager, bock, wheat, maybe pilsner	Liberty, German Tradition, Ultra	Mild and pleasant.

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<b>Hallertauer Tradition (German)</b>	3.5% to 5.5%	Mild-flavored beers	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
<b>Hersbrucker (German)</b>	3% to 5.5%	Lager, pilsner, bock, wheat	Mt. Hood, French Strisslespalt	Mild to semi-strong, pleasant, hoppy.
<b>Horizon</b>	11% to 14%	Ale, lager	Magnum or a high-alpha hop	Pleasantly hoppy.
<b>Kent Golding (U.K.)</b>	4% to 5.5%	All English-style ales, ESB, bitter	U.S. Golding, Whitbread Golding Variety, U.K. Progress	Gentle, fragrant, and pleasant.
<b>Liberty</b>	3% to 6%	Lager, pilsner, bock, wheat	Hallertauer Tradition, Hallertauer, Mt. Hood	Mild and clean aroma, slightly spicy character.
<b>Magnum</b>	13% to 15%	All beers, particularly lager, pilsner, stout	Northern Brewer	Known for bittering value and quality.
<b>Mt. Hood</b>	3% to 8%	Lager, pilsner, bock, wheat	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resinous.
<b>Northdown (U.K.)</b>	7.5% to 9.5%	All ales, porter		Fruity with some spiciness.
<b><u>Northern Brewer (U.S.)</u></b>	6% to 10%	ESB, bitter, English pale ale, porter, California (steam) beer	Nugget, Chinook	Medium-strong with some wild tones.
<b><u>Northern Brewer (German)</u></b>	7% to 10%	ESB, bitter, English pale ale, porter	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
<b>Northwest Golding</b>	4% to 5%	Ale, porter, stout, ESB, bitter		Known for aromatic properties.
<b>Nugget</b>	11% to 14.5%	Light lager	Columbus, Chinook, U.K. Target, Galena	Quite heavy and herbal.
<b>Olympic</b>	11% to 13%		Chinook	Mild to medium, citrusy aroma, spicy.
<b>Perle (U.S.)</b>	6% to 9.5%	Pale ale, porter, German styles	Northern Brewer, Cluster, Galena, Chinook	Known for its aromatic and bittering properties, pleasant and slightly spicy.
<b>Perle (German)</b>	6% to 8.5%	Pale ale, porter, lager	U.S. Perle, Northern Brewer	Moderately intense, good and hoppy, fruity and a little spicy.
<b>Phoenix (U.K.)</b>	4.2% to 5.5%	All ales	U.K. Northdown, U.K. Kent Golding, U.K. Challenger	Similar to U.K. Challenger.
<b>Pioneer (U.K.)</b>	8% to 10%	Ale, ESB	U.K. Kent Golding	A mild, typical English aroma.
<b>Polish Lublin</b>	3% to 4.5%	Pilsner	U.S. Saaz, Czech Saaz, U.S. Tettnanger	Mild and typical of noble aroma types, spicy, herbal.
<b>Pride of Ringwood (Australia)</b>	7% to 10%	Australian lager	Galena, Cluster	Quite pronounced, woody, earthy, herbal.
<b>Progress (U.K.)</b>	5% to 7.5%	Ale, bitter, ESB, porter	U.K. Kent Golding, Fuggle	Moderately strong, good aroma.
<b>Saaz (Czech)</b>	3% to 4.5%	Pilsner	U.S. Saaz, Polish Lublin	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
<b>Saaz (U.S.)</b>	3% to 5%	Pilsner, lager, wheat	Czech Saaz, Polish Lublin	Mild and pleasant, earthy and spicy.

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<b>Santiam</b>	5% to 7.9%	Lager, American ale, pilsner	German Tettnanger, German Spalt, German Spalt Select	Noble characteristics.
<b>Satus</b>	12.5% to 14%		Galena	Known for its bittering and aromatic properties.
<b>Simcoe</b>	12% to 14%			A bittering and aromatic hop.
<b>Spalt (German)</b>	4% to 5.5%	Lager	U.S. Saaz, U.S. Tettnanger, German Spalt Select	Mild and pleasant, slightly spicy.
<b>Spalt Select (German)</b>	4% to 6%	Lager, and any beer where noble aroma is wanted	U.S. Saaz, U.S. Tettnanger, German Spalt	Very fine Spalter-type aroma.
<b>Spalt Select (U.S.)</b>	3% to 5%	German lagers	Tettnanger, Saaz	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
<b>Sterling</b>	6% to 9%	Lager, ale, pilsner	Saaz, Polish Lublin	Herbal, spicy, pleasant aroma, hint of floral and citrus.
<b>Strisslespalt (France)</b>	3% to 5%	Pilsner, lager, wheat	Mt. Hood, Crystal, Hersbrucker	Medium intensity, pleasant, hoppy.
<b>Styrian Golding (Slovenia)</b>	4.5% to 6%	All English-style ales, ESB, bitter, lager	U.S. Fuggie, U.K. Fuggie, Willamette	Delicate, slightly spicy.
<b>Target (U.K.)</b>	9.5% to 12.5%	All ale and lager	Fuggie, Willamette	Pleasant English hop aroma, quite intense.
<b>Tettnanger (U.S.)</b>	3.4% to 5.2%	German ales and lagers, American lagers, wheat	German Spalt, Czech Saaz Santiam	An aromatic hop, mild and slightly spicy.
<b>Tettnanger (German)</b>	3.5% to 5.5%	Lager, ale	German Spalt, German Spalt Select, U.S. Tettnanger, Saaz	Mild and pleasant, slightly spicy, herbal.
<b>Tomahawk</b>	15% to 17%	Ale	Columbus	Primarily a bittering hop.
<b>Tradition (German)</b>	5% to 7%	Lager, pilsner	Hersbrucker, Hallertauer Mittelfrüh	Very fine and similar to Hallertauer Mittelfrüh.
<b>Ultra</b>	2% to 4.1%	Lager, pilsner, wheat, finish hop in ales	Liberty, Hallertauer Tradition, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.
<b>Vanguard</b>	4% to 5.67%		Saaz, Hallertauer Mittelfrüh	Aroma similar to continental European types.
<b>Warrior</b>	15% to 17%	Ale, stout	Nugget	A bittering and aromatic hop.
<b>WGV (Whitbread Golding Variety) (U.K.)</b>	5% to 7%	Ale	U.K. Kent Golding, U.K. Progress	Quite pleasant and hoppy, moderately intense.
<b>Willamette</b>	3.5% to 6%	Pale ale, ESB, bitter, English-style ale, porter, stout	U.S. Fuggie, U.S. Tettnanger, Styrian Golding	Mild and pleasant, slightly spicy, fruity, floral, a little earthy.
<b>Yakima Cluster</b>	6% to 8.5%			Used as a kettle hop for bittering.
<b>Zeus</b>	13% to 17%		Columbus	Aromatic and pleasant.