

# Comparing and Selecting Hops

So how do I choose the right hops for my beer? With such a wide range of flavor and aroma characteristics, this chart can serve as a helpful guide to more than one hundred varieties. Whether you are trying to duplicate a style or are looking to experiment, the following list can help to get you started. Just select a beer style below and a chart will pull up with appropriate hops to consider for your recipe.

American Amber & Pale Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Ahtanum	4-6.3%	Amarillo, Cascade	Floral, citrus, sharp, and piney.
Amarillo	8-9%	Cascade, Centennial	Citrusy, flowery.
Apollo	15-19%	Zeus	A high alpha acid varietal known for its disease resistance.
Boadicea (U.K.)	8-9%		spicy
Bravo	14-17%	Apollo, Zeus	
Cascade (U.S.)	4.5-7%	Amarillo, Centennial, possibly Columbus	Pleasant, flowery, spicy, and citrusy. Can have a grapefruit flavor.
Cascade (New Zealand)	6-8%	Ahtanum, Cascade, Centennial	Similar to US Cascade, has floral, citrus grapefruit character.
Centennial	8-11.5%	Cascade, possibly Columbus	Medium with floral and citrus tones.
Chinook	10-14%	Columbus, Northern Brewer, Nugget, U.K. Target	Mild to medium-heavy, spicy, piney, and grapefruity.
Citra (U.S.)	11-13%		intense flavor
Cluster	5.5-8.5%	Galena	Medium and quite spicy.
Columbus	11-16%	Chinook, Northern Brewer, Nugget, U.K. Target	Pleasant, with pungent aroma.
El Dorado (U.S.)	14-16%		candy-like

American Amber & Pale Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Galaxy (Australia)	13.5-14.8%		
Galena	10-14%	Chinook, Nugget, Pride of Ringwood	Medium but pleasant hoppiness, citrusy.
Glacier (U.S.)	5-9%	Styrian Golding, U.S. Fuggle, U.S. Tettnanger, Willamette	Dual purpose hop with a citrus earthy aroma.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Legacy (U.S.)	NA		Clean grapefruit, floral, black currant notes and a spicy aroma.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Nelson Sauvin (New Zealand)	12-14%		Unique hop with grape-like flavor
Newport	13-17%	Galena, Nugget	Fairly pungent.
Northern Brewer (German)	7-10%	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
Northern Brewer (U.S.)	6-10%	Chinook, Nugget	Medium-strong with some wild tones.
Northwest Golding	4-5%		Known for aromatic properties.
Nugget	11-14.5%	Chinook, Columbus, Galena, U.K. Target	Quite heavy and herbal.
Olympic	11-13%	Chinook	Mild to medium, citrusy aroma, spicy.
Opal (German)	5-8%	Styrian Golding	German dual-purpose hop
Pacific Gem (New Zealand)	13-15%		Bittering hop with a woody character.
Pacific Jade	12-14%		A "soft" bittering hop with

American Amber & Pale Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(New Zealand)			spicy and citrus aroma qualities.
Palisade	5.5-9.5%	Perhaps Cascade	Some "American" characteristics.
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Pride of Ringwood (Australia)	7-10%	Cluster, Galena	Quite pronounced, woody, earthy, herbal.
Riwaka (New Zealand)	4.5-6.5%	Czech Saaz, possible American "C" hops	Citrusy, grapefruit aroma hop
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Satus	12.5-14%	Galena	Known for its bittering and aromatic properties.
Simcoe	12-14%		A bittering and aromatic hop.
Sorachi Ace (Japan)	13-16%		Bittering hop with lemony aroma
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Summit	16-18%	Simcoe	Ultra high-alpha bittering hop
Sun	12-16%	Magnum	High-alpha hop with intense character
Super Alpha (New Zealand)	10-12%		Earthy, piney bittering hop.
Super Pride (Australia)	14%	Pride of Ringwood	A high alpha variety bred from Pride of Ringwood.

American Amber & Pale Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Target (U.K.)	9.5-12.5%	Fuggie, Willamette	Pleasant English hop aroma, quite intense.
Tomahawk	15-17%	Columbus	Primarily a bittering hop.
Warrior	15-17%	Nugget	A bittering and aromatic hop.
Willamette	3.5-6%	Styrian Golding, U.S. Fuggie, U.S. Tettnanger	Mild and pleasant, slightly spicy, fruity, floral, a little earthy.
Yakima Cluster	6-8.5%		Used as a kettle hop for bittering.
Zeus	13-17%	Columbus	Aromatic and pleasant.

<div>American Lager ▼</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Boadicea (U.K.)	8-9%		spicy
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing. Stores very well.
Chinook	10-14%	Columbus, Northern Brewer, Nugget, U.K. Target	Mild to medium-heavy, spicy, piney, and grapefruity.
Cluster	5.5-8.5%	Galena	Medium and quite spicy.
Crystal	2-4.5%	French Strisslespalt, Hallertauer, Hersbrucker, Liberty, Mt. Hood	Mild and pleasant, spicy and flowery.
El Dorado (U.S.)	14-16%		candy-like
Green Bullet (New Zealand)	11-14%	Crystal, Hallertauer Tradition, Liberty, Mt. Hood, Ultra	Dual purpose hop.
Hallertau Aroma (New Zealand)	6.5-8.5%	Perle	A dual purpose hop which has been used to replace Perle
Hallertauer (U.S.)	3.5-5.5%	Hallertauer Tradition, Liberty, Ultra	Very mild, pleasant, and slightly flowery, some spicy.
Hallertauer Gold (German)	6-6.5%	Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Herkules (German)	12-17%		bittering hop

American Lager ▼			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Legacy (U.S.)	NA		Clean grapefruit, floral, black currant notes and a spicy aroma.
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Merkur (German)	12-15%	Magnum	high-alpha, bittering hop
Millenium	12-15%	Nugget	Mild, herbal, similar to Nugget.
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resinous.
Mt. Rainier (U.S.)	5-8.1%	Hallertauer	only available in 2012
Newport	13-17%	Galena, Nugget	Fairly pungent.
Olympic	11-13%	Chinook	Mild to medium, citrusy aroma, spicy.
Pacific Jade (New Zealand)	12-14%		A "soft" bittering hop with spicy and citrus aroma qualities.
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir	2.5-	Any noble hops	Mild aroma hop.

American Lager			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(German)	4.5%		
Sladek (Czech)	5-6%	Czech Saaz, U.S. Saaz, U.S. Tettnanger	A dual-purpose Saaz hybrid.
Sorachi Ace (Japan)	13-16%		Bittering hop with lemony aroma
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Styrian Golding (Slovenia)	4.5-6%	U.K. Fuggle, U.S. Fuggle, Willamette	Delicate, slightly spicy.
Super Alpha (New Zealand)	10-12%		Earthy, piney bittering hop.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Taurus (German)	12-17%	Magnum	high-alpha hop
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger	3.4-	Czech Saaz, German	An aromatic hop, mild and

<div>American Lager</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(U.S.)	5.2%	Spalt, Santiam	slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.



American Pale Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Belma (U.S.)	12.1%		Clean bitterness, citrus, tropical fruit flavors.
Boadicea (U.K.)	8-9%		spicy
Calypso (U.S.)	12-14%		Exhibits pleasant fruity notes- apple, pear, fruit punch.
El Dorado (U.S.)	14-16%		candy-like
Hallertau Blanc (German)	9-12%		Winey, passion fruit, grapefruit, gooseberry, pineapple character.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Mandarina Bavaria (German)	7-10%	Cascade	Mandarin orangey flavor and aroma.
Opal (German)	5-8%	Styrian Golding	German dual-purpose hop
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor

Barleywine and Imperial Stout			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Admiral (U.K.)	13.5-16%	U.K. Challenger, U.K. Northdown, U.K. Target	Known for its bittering potential.
Apollo	15-19%	Zeus	A high alpha acid varietal known for its disease resistance.
Boadicea (U.K.)	8-9%		spicy
Bobek (Slovenia)	3.5-7%	U.K. Fuggle	
Bramling Cross (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress, Whitbread Golding Variety	Quite mild, fruity currant aroma.
Brewer's Gold (U.S.)	7-10%	Bullion	Bittering hop with neutral aroma character.
Bullion (U.K.)	6.5-9%	Columbus, Northern Brewer	A rich hop primarily used for bittering. Intense blackcurrant aroma.
Cascade (U.S.)	4.5-7%	Amarillo, Centennial, possibly Columbus	Pleasant, flowery, spicy, and citrusy. Can have a grapefruit flavor.
Cascade (New Zealand)	6-8%	Ahtanum, Cascade, Centennial	Similar to US Cascade, has floral, citrus grapefruit character.
Centennial	8-11.5%	Cascade, possibly Columbus	Medium with floral and citrus tones.
Challenger (U.K.)	6.5-8.5%	Northern Brewer, U.S. or German Perle	Mild to moderate, quite spicy.
Chinook	10-14%	Columbus, Northern Brewer, Nugget, U.K. Target	Mild to medium-heavy, spicy, piney, and grapefruity.
Cluster	5.5-8.5%	Galena	Medium and quite spicy.
Columbus	11-16%	Chinook, Northern Brewer, Nugget, U.K. Target	Pleasant, with pungent aroma.
El Dorado (U.S.)	14-16%		candy-like

Barleywine and Imperial Stout			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
First Gold (U.K.)	6.5-8.5%	maybe Crystal, U.K. Kent Golding	A little like Golding family; spicy.
Fuggle (U.K.)	4-5.5%	Styrian Golding, U.S. Fuggle, Willamette	Mild, pleasant, hoppy, and robust.
Fuggle (U.S.)	4-5.5%	Styrian Golding, U.K. Fuggle, U.S. Tettnanger, Willamette	Mild and pleasant, earthy and fruity.
Galena	10-14%	Chinook, Nugget, Pride of Ringwood	Medium but pleasant hoppiness, citrusy.
Golding (U.S.)	4-6%	U.K. Golding, U.K. Progress, Whitbread Golding Variety	Mild, extremely pleasant, and gently hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Kent Golding (U.K.)	4-5.5%	U.K. Progress, U.S. Golding, Whitbread Golding Variety	Gentle, fragrant, and pleasant.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Nelson Sauvin (New Zealand)	12-14%		Unique hop with grape-like flavor
Newport	13-17%	Galena, Nugget	Fairly pungent.
Northdown (U.K.)	7.5-9.5%		Fruity with some spiciness.
Northern Brewer (German)	7-10%	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
Northern Brewer (U.S.)	6-10%	Chinook, Nugget	Medium-strong with some wild tones.
Northwest Golding	4-5%		Known for aromatic properties.
Nugget	11-14.5%	Chinook, Columbus, Galena, U.K. Target	Quite heavy and herbal.
Olympic	11-13%	Chinook	Mild to medium, citrusy

Barleywine and Imperial Stout			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
			aroma, spicy.
Pacific Gem (New Zealand)	13-15%		Bittering hop with a woody character.
Pacific Jade (New Zealand)	12-14%		A "soft" bittering hop with spicy and citrus aroma qualities.
Palisade	5.5-9.5%	Perhaps Cascade	Some "American" characteristics.
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Phoenix (U.K.)	8-13%	U.K. Challenger, U.K. Kent Golding, U.K. Northdown	Similar to U.K. Challenger.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Pioneer (U.K.)	8-10%	U.K. Kent Golding	A mild, typical English aroma.
Pride of Ringwood (Australia)	7-10%	Cluster, Galena	Quite pronounced, woody, earthy, herbal.
Progress (U.K.)	5-7.5%	Fuggle, U.K. Kent Golding	Moderately strong, good aroma.
Satus	12.5-14%	Galena	Known for its bittering and aromatic properties.
Simcoe	12-14%		A bittering and aromatic hop.
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Summit	16-18%	Simcoe	Ultra high-alpha bittering

Barleywine and Imperial Stout			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
			hop
Sun	12-16%	Magnum	High-alpha hop with intense character
Super Alpha (New Zealand)	10-12%		Earthy, piney bittering hop.
Target (U.K.)	9.5-12.5%	Fuggie, Willamette	Pleasant English hop aroma, quite intense.
Tomahawk	15-17%	Columbus	Primarily a bittering hop.
Warrior	15-17%	Nugget	A bittering and aromatic hop.
WGV (Whitbread Golding Variety) (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress	Quite pleasant and hoppy, moderately intense.
Willamette	3.5-6%	Styrian Golding, U.S. Fuggie, U.S. Tettnanger	Mild and pleasant, slightly spicy, fruity, floral, a little earthy.
Yakima Cluster	6-8.5%		Used as a kettle hop for bittering.
Zeus	13-17%	Columbus	Aromatic and pleasant.

<div> Belgian and French Ale </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Belma (U.S.)	12.1%		Clean bitterness, citrus, tropical fruit flavors.
Boadicea (U.K.)	8-9%		spicy
El Dorado (U.S.)	14-16%		candy-like
Hallertauer (U.S.)	3.5-5.5%	Hallertauer Tradition, Liberty, Ultra	Very mild, pleasant, and slightly flowery, some spicy.
Hallertauer Gold (German)	6-6.5%	Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Huell Melon (German)	7-8%		Honeydew melon and strawberry aroma.
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Mandarina Bavaria (German)	7-10%	Cascade	Mandarin orangey flavor and aroma.
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resiny.
Mt. Rainier	5-8.1%	Hallertauer	only available in 2012

<div> Belgian and French Ale </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(U.S.)			
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Polaris (German)	18-24%		Minty, icy quality.
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.

Belgian and French Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.



<div> <div>Belgian Lambic and Sour Ale</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Boadicea (U.K.)	8-9%		spicy
El Dorado (U.S.)	14-16%		candy-like
Hallertauer (U.S.)	3.5-5.5%	Hallertauer Tradition, Liberty, Ultra	Very mild, pleasant, and slightly flowery, some spicy.
Hallertauer Gold (German)	6-6.5%	Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resinous.
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and

Name	Alpha Acid %	Possible Substitutions	Flavor Description
			spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.



<div> <div>Belgian Strong Ale</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Boadicea (U.K.)	8-9%		spicy
El Dorado (U.S.)	14-16%		candy-like
Hallertauer (U.S.)	3.5-5.5%	Hallertauer Tradition, Liberty, Ultra	Very mild, pleasant, and slightly flowery, some spicy.
Hallertauer Gold (German)	6-6.5%	Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resinous.
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy

<div> <div>Belgian Strong Ale</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
			notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.

<div>Belgian Strong Ale</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.

<div> <div>Bock</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Boadicea (U.K.)	8-9%		spicy
Brewer's Gold (German)	6-7%	Bullion, Galena, Northdown, Northern Brewer	Black currant, fruity, spicy.
El Dorado (U.S.)	14-16%		candy-like
Green Bullet (New Zealand)	11-14%	Crystal, Hallertauer Tradition, Liberty, Mt. Hood, Ultra	Dual purpose hop.
Hallertauer (U.S.)	3.5-5.5%	Hallertauer Tradition, Liberty, Ultra	Very mild, pleasant, and slightly flowery, some spicy.
Hallertauer Gold (German)	6-6.5%	Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Herkules (German)	12-17%		bittering hop
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Merkur (German)	12-15%	Magnum	high-alpha, bittering hop
Motueka (New	6.5-7.5%	Czech Saaz, U.S. Saaz	New aroma hop

<div> <div>Bock</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Zealand)			
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resinous.
Mt. Rainier (U.S.)	5-8.1%	Hallertauer	only available in 2012
Pacifica (New Zealand)	5-6%	Hallertau family	An aroma hop with some citrus and floral character
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Select (German)	4-6%	Czech Saaz, German Spalt, Tettnanger	noble-type aroma
Sladek (Czech)	5-6%	Czech Saaz, U.S. Saaz, U.S. Tettnanger	A dual-purpose Saaz hybrid.
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-



<div> <div>Bock</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
			strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Super Alpha (New Zealand)	10-12%		Earthy, piney bittering hop.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Taurus (German)	12-17%	Magnum	high-alpha hop
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.

Brown Ale

Name	Alpha Acid %	Possible Substitutions	Flavor Description
Ahtanum	4-6.3%	Amarillo, Cascade	Floral, citrus, sharp, and piney.
Boadicea (U.K.)	8-9%		spicy
Bobeck (Slovenia)	3.5-7%	U.K. Fuggle	
Brewer's Gold (U.S.)	7-10%	Bullion	Bittering hop with neutral aroma character.
Bullion (U.K.)	6.5-9%	Columbus, Northern Brewer	A rich hop primarily used for bittering. Intense blackcurrant aroma.
Cascade (U.S.)	4.5-7%	Amarillo, Centennial, possibly Columbus	Pleasant, flowery, spicy, and citrusy. Can have a grapefruit flavor.
Cascade (New Zealand)	6-8%	Ahtanum, Cascade, Centennial	Similar to US Cascade, has floral, citrus grapefruit character.
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing. Stores very well.
Centennial	8-11.5%	Cascade, possibly Columbus	Medium with floral and citrus tones.
Chinook	10-14%	Columbus, Northern Brewer, Nugget, U.K. Target	Mild to medium-heavy, spicy, piney, and grapefruity.
Cluster	5.5-8.5%	Galena	Medium and quite spicy.
Columbus	11-16%	Chinook, Northern Brewer, Nugget, U.K. Target	Pleasant, with pungent aroma.
El Dorado (U.S.)	14-16%		candy-like
First Gold (U.K.)	6.5-8.5%	maybe Crystal, U.K. Kent Golding	A little like Golding family; spicy.
Fuggle (U.K.)	4-5.5%	Styrian Golding, U.S. Fuggle, Willamette	Mild, pleasant, hoppy, and robust.

Brown Ale

Name	Alpha Acid %	Possible Substitutions	Flavor Description
Fuggle (U.S.)	4-5.5%	Styrian Golding, U.K. Fuggle, U.S. Tettnanger, Willamette	Mild and pleasant, earthy and fruity.
Galena	10-14%	Chinook, Nugget, Pride of Ringwood	Medium but pleasant hoppiness, citrusy.
Golding (U.S.)	4-6%	U.K. Golding, U.K. Progress, Whitbread Golding Variety	Mild, extremely pleasant, and gently hoppy.
Herald (U.K.)	11-13%		New dual-purpose hop
Horizon	11-14%	Magnum	Pleasantly hoppy.
Kent Golding (U.K.)	4-5.5%	U.K. Progress, U.S. Golding, Whitbread Golding Variety	Gentle, fragrant, and pleasant.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Newport	13-17%	Galena, Nugget	Fairly pungent.
Northdown (U.K.)	7.5-9.5%		Fruity with some spiciness.
Northern Brewer (German)	7-10%	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
Northern Brewer (U.S.)	6-10%	Chinook, Nugget	Medium-strong with some wild tones.
Northwest Golding	4-5%		Known for aromatic properties.
Nugget	11-14.5%	Chinook, Columbus, Galena, U.K. Target	Quite heavy and herbal.
Olympic	11-13%	Chinook	Mild to medium, citrusy aroma, spicy.
Opal (German)	5-8%	Styrian Golding	German dual-purpose hop
Pacific Jade	12-14%		A "soft" bittering hop with spicy

Brown Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(New Zealand)			and citrus aroma qualities.
Palisade	5.5-9.5%	Perhaps Cascade	Some "American" characteristics.
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Phoenix (U.K.)	8-13%	U.K. Challenger, U.K. Kent Golding, U.K. Northdown	Similar to U.K. Challenger.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Pioneer (U.K.)	8-10%	U.K. Kent Golding	A mild, typical English aroma.
Progress (U.K.)	5-7.5%	Fuggle, U.K. Kent Golding	Moderately strong, good aroma.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Satus	12.5-14%	Galena	Known for its bittering and aromatic properties.
Simcoe	12-14%		A bittering and aromatic hop.
Sorachi Ace (Japan)	13-16%		Bittering hop with lemony aroma
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Styrian Golding (Slovenia)	4.5-6%	U.K. Fuggle, U.S. Fuggle, Willamette	Delicate, slightly spicy.
Summit	16-18%	Simcoe	Ultra high-alpha bittering hop
Sun	12-16%	Magnum	High-alpha hop with intense character
Super Alpha	10-12%		Earthy, piney bittering hop.

<div>Brown Ale</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(New Zealand)			
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Tomahawk	15-17%	Columbus	Primarily a bittering hop.
Warrior	15-17%	Nugget	A bittering and aromatic hop.
WGV (Whitbread Golding Variety) (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress	Quite pleasant and hoppy, moderately intense.
Willamette	3.5-6%	Styrian Golding, U.S. Fuggle, U.S. Tettnanger	Mild and pleasant, slightly spicy, fruity, floral, a little earthy.
Yakima Cluster	6-8.5%		Used as a kettle hop for bittering.
Zeus	13-17%	Columbus	Aromatic and pleasant.

<div>Cider</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Boadicea (U.K.)	8-9%		spicy
El Dorado (U.S.)	14-16%		candy-like
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor

Name	Alpha Acid %	Possible Substitutions	Flavor Description
Admiral (U.K.)	13.5-16%	U.K. Challenger, U.K. Northdown, U.K. Target	Known for its bittering potential.
Boadicea (U.K.)	8-9%		spicy
Bobek (Slovenia)	3.5-7%	U.K. Fuggle	
Bramling Cross (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress, Whitbread Golding Variety	Quite mild, fruity currant aroma.
Brewer's Gold (U.S.)	7-10%	Bullion	Bittering hop with neutral aroma character.
Brewer's Gold (German)	6-7%	Bullion, Galena, Northdown, Northern Brewer	Black currant, fruity, spicy.
Bullion (U.K.)	6.5-9%	Columbus, Northern Brewer	A rich hop primarily used for bittering. Intense blackcurrant aroma.
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing. Stores very well.
Challenger (U.K.)	6.5-8.5%	Northern Brewer, U.S. or German Perle	Mild to moderate, quite spicy.
El Dorado (U.S.)	14-16%		candy-like
First Gold (U.K.)	6.5-8.5%	maybe Crystal, U.K. Kent Golding	A little like Golding family; spicy.
Fuggle (U.K.)	4-5.5%	Styrian Golding, U.S. Fuggle, Willamette	Mild, pleasant, hoppy, and robust.
Fuggle (U.S.)	4-5.5%	Styrian Golding, U.K. Fuggle, U.S. Tettnanger, Willamette	Mild and pleasant, earthy and fruity.
Golding (U.S.)	4-6%	U.K. Golding, U.K. Progress, Whitbread	Mild, extremely pleasant, and gently hoppy.

English &amp; Scottish Strong Ale

Name	Alpha Acid %	Possible Substitutions	Flavor Description
		Golding Variety	
Herald (U.K.)	11-13%		New dual-purpose hop
Horizon	11-14%	Magnum	Pleasantly hoppy.
Kent Golding (U.K.)	4-5.5%	U.K. Progress, U.S. Golding, Whitbread Golding Variety	Gentle, fragrant, and pleasant.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Northdown (U.K.)	7.5-9.5%		Fruity with some spiciness.
Northern Brewer (German)	7-10%	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
Northern Brewer (U.S.)	6-10%	Chinook, Nugget	Medium-strong with some wild tones.
Northwest Golding	4-5%		Known for aromatic properties.
Phoenix (U.K.)	8-13%	U.K. Challenger, U.K. Kent Golding, U.K. Northdown	Similar to U.K. Challenger.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Pioneer (U.K.)	8-10%	U.K. Kent Golding	A mild, typical English aroma.
Progress (U.K.)	5-7.5%	Fuggie, U.K. Kent Golding	Moderately strong, good aroma.
Sorachi Ace (Japan)	13-16%		Bittering hop with lemony aroma
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggie	mild flavor
Styrian Golding	4.5-6%	U.K. Fuggie, U.S.	Delicate, slightly spicy.



English & Scottish Strong Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(Slovenia)		Fuggles, Willamette	
Super Alpha (New Zealand)	10-12%		Earthy, piney bittering hop.
Super Pride (Australia)	14%	Pride of Ringwood	A high alpha variety bred from Pride of Ringwood.
Target (U.K.)	9.5-12.5%	Fuggles, Willamette	Pleasant English hop aroma, quite intense.
WGV (Whitbread Golding Variety) (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress	Quite pleasant and hoppy, moderately intense.
Willamette	3.5-6%	Styrian Golding, U.S. Fuggles, U.S. Tettnanger	Mild and pleasant, slightly spicy, fruity, floral, a little earthy.

Name	Alpha Acid %	Possible Substitutions	Flavor Description
Admiral (U.K.)	13.5-16%	U.K. Challenger, U.K. Northdown, U.K. Target	Known for its bittering potential.
Apollo	15-19%	Zeus	A high alpha acid varietal known for its disease resistance.
Boadicea (U.K.)	8-9%		spicy
Bobek (Slovenia)	3.5-7%	U.K. Fuggle	
Bramling Cross (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress, Whitbread Golding Variety	Quite mild, fruity currant aroma.
Brewer's Gold (U.S.)	7-10%	Bullion	Bittering hop with neutral aroma character.
Brewer's Gold (German)	6-7%	Bullion, Galena, Northdown, Northern Brewer	Black currant, fruity, spicy.
Bullion (U.K.)	6.5-9%	Columbus, Northern Brewer	A rich hop primarily used for bittering. Intense blackcurrant aroma.
Cascade (Argentina)	3-5%	Any noble hops	Different than US grown Cascades with more of a spicy flavor and lemony aroma.
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing. Stores very well.
Challenger (U.K.)	6.5-8.5%	Northern Brewer, U.S. or German Perle	Mild to moderate, quite spicy.
El Dorado (U.S.)	14-16%		candy-like
First Gold (U.K.)	6.5-8.5%	maybe Crystal, U.K. Kent Golding	A little like Golding family; spicy.
Fuggle (U.K.)	4-5.5%	Styrian Golding, U.S. Fuggle, Willamette	Mild, pleasant, hoppy, and robust.

English Bitter &amp; Pale Ale

Name	Alpha Acid %	Possible Substitutions	Flavor Description
Fuggle (U.S.)	4-5.5%	Styrian Golding, U.K. Fuggle, U.S. Tettnanger, Willamette	Mild and pleasant, earthy and fruity.
Galena	10-14%	Chinook, Nugget, Pride of Ringwood	Medium but pleasant hoppiness, citrusy.
Glacier (U.S.)	5-9%	Styrian Golding, U.S. Fuggle, U.S. Tettnanger, Willamette	Dual purpose hop with a citrus earthy aroma.
Golding (U.S.)	4-6%	U.K. Golding, U.K. Progress, Whitbread Golding Variety	Mild, extremely pleasant, and gently hoppy.
Herald (U.K.)	11-13%		New dual-purpose hop
Horizon	11-14%	Magnum	Pleasantly hoppy.
Kent Golding (U.K.)	4-5.5%	U.K. Progress, U.S. Golding, Whitbread Golding Variety	Gentle, fragrant, and pleasant.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Nelson Sauvin (New Zealand)	12-14%		Unique hop with grape-like flavor
Newport	13-17%	Galena, Nugget	Fairly pungent.
Northdown (U.K.)	7.5-9.5%		Fruity with some spiciness.
Northern Brewer (German)	7-10%	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
Northern Brewer (U.S.)	6-10%	Chinook, Nugget	Medium-strong with some wild tones.
Northwest Golding	4-5%		Known for aromatic properties.
Opal (German)	5-8%	Styrian Golding	German dual-purpose hop
Pacific Gem	13-15%		Bittering hop with a woody

Name	Alpha Acid %	Possible Substitutions	Flavor Description
(New Zealand)			character.
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Phoenix (U.K.)	8-13%	U.K. Challenger, U.K. Kent Golding, U.K. Northdown	Similar to U.K. Challenger.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Pioneer (U.K.)	8-10%	U.K. Kent Golding	A mild, typical English aroma.
Pride of Ringwood (Australia)	7-10%	Cluster, Galena	Quite pronounced, woody, earthy, herbal.
Progress (U.K.)	5-7.5%	Fuggle, U.K. Kent Golding	Moderately strong, good aroma.
Satus	12.5-14%	Galena	Known for its bittering and aromatic properties.
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Styrian Golding (Slovenia)	4.5-6%	U.K. Fuggle, U.S. Fuggle, Willamette	Delicate, slightly spicy.
Super Pride (Australia)	14%	Pride of Ringwood	A high alpha variety bred from Pride of Ringwood.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
WGV (Whitbread Golding Variety) (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress	Quite pleasant and hoppy, moderately intense.
Willamette	3.5-6%	Styrian Golding, U.S. Fuggle, U.S. Tettnanger	Mild and pleasant, slightly spicy, fruity, floral, a little earthy.

European Dark Lager			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Aurora (Slovenia)	6-8%	Northern Brewer	
Boadicea (U.K.)	8-9%		spicy
Brewer's Gold (German)	6-7%	Bullion, Galena, Northdown, Northern Brewer	Black currant, fruity, spicy.
Cascade (Argentina)	3-5%	Any noble hops	Different than US grown Cascades with more of a spicy flavor and lemony aroma.
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing. Stores very well.
Crystal	2-4.5%	French Strisslespalt, Hallertauer, Hersbrucker, Liberty, Mt. Hood	Mild and pleasant, spicy and flowery.
El Dorado (U.S.)	14-16%		candy-like
Hallertau Aroma (New Zealand)	6.5-8.5%	Perle	A dual purpose hop which has been used to replace Perle
Herkules (German)	12-17%		bittering hop
Horizon	11-14%	□agnum	Pleasantly hoppy.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Marynka (Poland)	9-12%		New hop variety with intense aroma
Merkur (German)	12-15%	Magnum	high-alpha, bittering hop

<div>European Dark Lager</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Motueka (New Zealand)	6.5-7.5%	Czech Saaz, U.S. Saaz	New aroma hop
Mt. Rainier (U.S.)	5-8.1%	Hallertauer	only available in 2012
Pacifica (New Zealand)	5-6%	Hallertau family	An aroma hop with some citrus and floral character
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Select (German)	4-6%	Czech Saaz, German Spalt, Tettnanger	noble-type aroma
Sladek (Czech)	5-6%	Czech Saaz, U.S. Saaz, U.S. Tettnanger	A dual-purpose Saaz hybrid.
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.

European Dark Lager			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Styrian Golding (Slovenia)	4.5-6%	U.K. Fuggle, U.S. Fuggle, Willamette	Delicate, slightly spicy.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Taurus (German)	12-17%	Magnum	high-alpha hop
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.

European Pale Lager			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Aurora (Slovenia)	6-8%	Northern Brewer	
Boadicea (U.K.)	8-9%		spicy
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing. Stores very well.
Crystal	2-4.5%	French Strisslespalt, Hallertauer, Hersbrucker, Liberty, Mt. Hood	Mild and pleasant, spicy and flowery.
El Dorado (U.S.)	14-16%		candy-like
Green Bullet (New Zealand)	11-14%	Crystal, Hallertauer Tradition, Liberty, Mt. Hood, Ultra	Dual purpose hop.
Hallertau Aroma (New Zealand)	6.5-8.5%	Perle	A dual purpose hop which has been used to replace Perle
Hallertauer (U.S.)	3.5-5.5%	Hallertauer Tradition, Liberty, Ultra	Very mild, pleasant, and slightly flowery, some spicy.
Hallertauer Gold (German)	6-6.5%	Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Herkules (German)	12-17%		bittering hop
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.



European Pale Lager

Name	Alpha Acid %	Possible Substitutions	Flavor Description
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Lublin (Poland)	3-4.5%	Czech Saaz, U.S. Saaz, U.S. Tettnanger	Mild and typical of noble aroma types, spicy, herbal.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Marynka (Poland)	9-12%		New hop variety with intense aroma
Merkur (German)	12-15%	Magnum	high-alpha, bittering hop
Millenium	12-15%	Nugget	Mild, herbal, similar to Nugget.
Motueka (New Zealand)	6.5-7.5%	Czech Saaz, U.S. Saaz	New aroma hop
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resinous.
Mt. Rainier (U.S.)	5-8.1%	Hallertauer	only available in 2012
Pacific Jade (New Zealand)	12-14%		A "soft" bittering hop with spicy and citrus aroma qualities.
Pacifica (New Zealand)	5-6%	Hallertau family	An aroma hop with some citrus and floral character
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Premiant (Czech)	8-12.5%		A dual purpose variety with a balanced bitterness and slightly spicy aroma

European Pale Lager			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Select (German)	4-6%	Czech Saaz, German Spalt, Tettnanger	noble-type aroma
Sladek (Czech)	5-6%	Czech Saaz, U.S. Saaz, U.S. Tettnanger	A dual-purpose Saaz hybrid.
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Styrian Golding (Slovenia)	4.5-6%	U.K. Fuggle, U.S. Fuggle, Willamette	Delicate, slightly spicy.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.

European Pale Lager			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Taurus (German)	12-17%	Magnum	high-alpha hop
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.

<div>Fruit Beer</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Boadicea (U.K.)	8-9%		spicy
El Dorado (U.S.)	14-16%		candy-like
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resinous.
Mt. Rainier (U.S.)	5-8.1%	Hallertauer	only available in 2012
Opal (German)	5-8%	Styrian Golding	German dual-purpose hop
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and

<div>Fruit Beer</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
			spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Smaragd (German)	4-6%		fine aroma
Sorachi Ace (Japan)	13-16%		Bittering hop with lemony aroma
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition,	Very good to outstanding, some

<div>Fruit Beer</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
		Liberty, Saaz	Saaz-like qualities. Aromatic properties similar to Hallertauer.
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.

<div> German Amber Lager </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Aurora (Slovenia)	6-8%	Northern Brewer	
Boadicea (U.K.)	8-9%		spicy
Cascade (Argentina)	3-5%	Any noble hops	Different than US grown Cascades with more of a spicy flavor and lemony aroma.
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing. Stores very well.
El Dorado (U.S.)	14-16%		candy-like
Green Bullet (New Zealand)	11-14%	Crystal, Hallertauer Tradition, Liberty, Mt. Hood, Ultra	Dual purpose hop.
Hallertau Aroma (New Zealand)	6.5-8.5%	Perle	A dual purpose hop which has been used to replace Perle
Hallertauer (U.S.)	3.5-5.5%	Hallertauer Tradition, Liberty, Ultra	Very mild, pleasant, and slightly flowery, some spicy.
Hallertauer Gold (German)	6-6.5%	Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Herkules (German)	12-17%		bittering hop
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Liberty	3-6%	Hallertauer,	Mild and clean aroma, slightly

<div> German Amber Lager </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
		Hallertauer Tradition, Mt. Hood	spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Merkur (German)	12-15%	Magnum	high-alpha, bittering hop
Motueka (New Zealand)	6.5-7.5%	Czech Saaz, U.S. Saaz	New aroma hop
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resiny.
Mt. Rainier (U.S.)	5-8.1%	Hallertauer	only available in 2012
Pacifica (New Zealand)	5-6%	Hallertau family	An aroma hop with some citrus and floral character
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Select (German)	4-6%	Czech Saaz, German Spalt, Tettnanger	noble-type aroma



<div> German Amber Lager </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Sladek (Czech)	5-6%	Czech Saaz, U.S. Saaz, U.S. Tettnanger	A dual-purpose Saaz hybrid.
Sorachi Ace (Japan)	13-16%		Bittering hop with lemony aroma
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Taurus (German)	12-17%	Magnum	high-alpha hop
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.

<div>German Amber Lager</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.

India Pale Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Admiral (U.K.)	13.5-16%	U.K. Challenger, U.K. Northdown, U.K. Target	Known for its bittering potential.
Ahtanum	4-6.3%	Amarillo, Cascade	Floral, citrus, sharp, and piney.
Amarillo	8-9%	Cascade, Centennial	Citrusy, flowery.
Apollo	15-19%	Zeus	A high alpha acid varietal known for its disease resistance.
Boadicea (U.K.)	8-9%		spicy
Bobeck (Slovenia)	3.5-7%	U.K. Fuggle	
Bramling Cross (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress, Whitbread Golding Variety	Quite mild, fruity currant aroma.
Bravo	14-17%	Apollo, Zeus	
Brewer's Gold (U.S.)	7-10%	Bullion	Bittering hop with neutral aroma character.
Brewer's Gold (German)	6-7%	Bullion, Galena, Northdown, Northern Brewer	Black currant, fruity, spicy.
Bullion (U.K.)	6.5-9%	Columbus, Northern Brewer	A rich hop primarily used for bittering. Intense blackcurrant aroma.
Calypso (U.S.)	12-14%		Exhibits pleasant fruity notes-apple, pear, fruit punch.
Cascade (U.S.)	4.5-7%	Amarillo, Centennial, possibly Columbus	Pleasant, flowery, spicy, and citrusy. Can have a grapefruit flavor.
Cascade (New Zealand)	6-8%	Ahtanum, Cascade, Centennial	Similar to US Cascade, has floral, citrus grapefruit character.
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing.

<div>India Pale Ale</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
			Stores very well.
Centennial	8-11.5%	Cascade, possibly Columbus	Medium with floral and citrus tones.
Challenger (U.K.)	6.5-8.5%	Northern Brewer, U.S. or German Perle	Mild to moderate, quite spicy.
Chinook	10-14%	Columbus, Northern Brewer, Nugget, U.K. Target	Mild to medium-heavy, spicy, piney, and grapefruity.
Citra (U.S.)	11-13%		intense flavor
Cluster	5.5-8.5%	Galena	Medium and quite spicy.
Columbus	11-16%	Chinook, Northern Brewer, Nugget, U.K. Target	Pleasant, with pungent aroma.
El Dorado (U.S.)	14-16%		candy-like
First Gold (U.K.)	6.5-8.5%	maybe Crystal, U.K. Kent Golding	A little like Golding family; spicy.
Fuggle (U.K.)	4-5.5%	Styrian Golding, U.S. Fuggle, Willamette	Mild, pleasant, hoppy, and robust.
Fuggle (U.S.)	4-5.5%	Styrian Golding, U.K. Fuggle, U.S. Tettnanger, Willamette	Mild and pleasant, earthy and fruity.
Galaxy (Australia)	13.5-14.8%		
Galena	10-14%	Chinook, Nugget, Pride of Ringwood	Medium but pleasant hoppiness, citrusy.
Glacier (U.S.)	5-9%	Styrian Golding, U.S. Fuggle, U.S. Tettnanger, Willamette	Dual purpose hop with a citrus earthy aroma.
Golding (U.S.)	4-6%	U.K. Golding, U.K. Progress, Whitbread Golding Variety	Mild, extremely pleasant, and gently hoppy.
Hallertau Blanc (German)	9-12%		Winey, passion fruit, grapefruit, gooseberry, pineapple character.

<div>India Pale Ale</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Horizon	11-14%	Magnum	Pleasantly hoppy.
Huell Melon (German)	7-8%		Honeydew melon and strawberry aroma.
Kent Golding (U.K.)	4-5.5%	U.K. Progress, U.S. Golding, Whitbread Golding Variety	Gentle, fragrant, and pleasant.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Mosaic	11.5-13.5%	Nugget, Simcoe	Both fruity and containing grassy, floral, earthy notes.
Nelson Sauvin (New Zealand)	12-14%		Unique hop with grape-like flavor
Newport	13-17%	Galena, Nugget	Fairly pungent.
Northdown (U.K.)	7.5-9.5%		Fruity with some spiciness.
Northern Brewer (German)	7-10%	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
Northern Brewer (U.S.)	6-10%	Chinook, Nugget	Medium-strong with some wild tones.
Northwest Golding	4-5%		Known for aromatic properties.
Nugget	11-14.5%	Chinook, Columbus, Galena, U.K. Target	Quite heavy and herbal.
Olympic	11-13%	Chinook	Mild to medium, citrusy aroma, spicy.
Pacific Gem (New Zealand)	13-15%		Bittering hop with a woody character.
Pacific Jade (New Zealand)	12-14%		A "soft" bittering hop with spicy and citrus aroma qualities.
Palisade	5.5-9.5%	Perhaps Cascade	Some "American" characteristics.

India Pale Ale			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Phoenix (U.K.)	8-13%	U.K. Challenger, U.K. Kent Golding, U.K. Northdown	Similar to U.K. Challenger.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Pioneer (U.K.)	8-10%	U.K. Kent Golding	A mild, typical English aroma.
Pride of Ringwood (Australia)	7-10%	Cluster, Galena	Quite pronounced, woody, earthy, herbal.
Progress (U.K.)	5-7.5%	Fuggle, U.K. Kent Golding	Moderately strong, good aroma.
Riwaka (New Zealand)	4.5-6.5%	Czech Saaz, possible American "C" hops	Citrusy, grapefruit aroma hop
Satus	12.5-14%	Galena	Known for its bittering and aromatic properties.
Simcoe	12-14%		A bittering and aromatic hop.
Sorachi Ace (Japan)	13-16%		Bittering hop with lemony aroma
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Styrian Golding (Slovenia)	4.5-6%	U.K. Fuggle, U.S. Fuggle, Willamette	Delicate, slightly spicy.
Summit	16-18%	Simcoe	Ultra high-alpha bittering hop
Sun	12-16%	Magnum	High-alpha hop with intense character
Super Alpha (New Zealand)	10-12%		Earthy, piney bittering hop.

<div>India Pale Ale</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Super Pride (Australia)	14%	Pride of Ringwood	A high alpha variety bred from Pride of Ringwood.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Tomahawk	15-17%	Columbus	Primarily a bittering hop.
Warrior	15-17%	Nugget	A bittering and aromatic hop.
WGV (Whitbread Golding Variety) (U.K.)	5-7%	U.K. Kent Golding, U.K. Progress	Quite pleasant and hoppy, moderately intense.
Willamette	3.5-6%	Styrian Golding, U.S. Fuggle, U.S. Tettnanger	Mild and pleasant, slightly spicy, fruity, floral, a little earthy.
Yakima Cluster	6-8.5%		Used as a kettle hop for bittering.
Zeus	13-17%	Columbus	Aromatic and pleasant.

<div>Kölsch &amp; Altbier</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Aurora (Slovenia)	6-8%	Northern Brewer	
Boadicea (U.K.)	8-9%		spicy
Cascade (Argentina)	3-5%	Any noble hops	Different than US grown Cascades with more of a spicy flavor and lemony aroma.
El Dorado (U.S.)	14-16%		candy-like
Hallertau Aroma (New Zealand)	6.5-8.5%	Perle	A dual purpose hop which has been used to replace Perle
Hallertauer (U.S.)	3.5-5.5%	Hallertauer Tradition, Liberty, Ultra	Very mild, pleasant, and slightly flowery, some spicy.
Hallertauer Gold (German)	6-6.5%	Crystal, Mt. Hood	Known for its aromatic properties similar to Hallertauer.
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resiny.
Mt. Rainier	5-8.1%	Hallertauer	only available in 2012



<div>Kölsch &amp; Altbier</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(U.S.)			
Northern Brewer (German)	7-10%	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
Opal (German)	5-8%	Styrian Golding	German dual-purpose hop
Pacific Jade (New Zealand)	12-14%		A "soft" bittering hop with spicy and citrus aroma qualities.
Pacifica (New Zealand)	5-6%	Hallertau family	An aroma hop with some citrus and floral character
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Sladek (Czech)	5-6%	Czech Saaz, U.S. Saaz, U.S. Tettnanger	A dual-purpose Saaz hybrid.
Smaragd (German)	4-6%		fine aroma
Southern Cross (New Zealand)	11-14%		Piney, resinous bittering hop
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.

<div>Kölsch &amp; Altbier</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Super Alpha (New Zealand)	10-12%		Earthy, piney bittering hop.
Target (U.K.)	9.5-12.5%	Fuggle, Willamette	Pleasant English hop aroma, quite intense.
Taurus (German)	12-17%	Magnum	high-alpha hop
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.

<div> <div>Light Ale</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Boadicea (U.K.)	8-9%		spicy
Bobek (Slovenia)	3.5-7%	U.K. Fuggle	
Cascade (U.S.)	4.5-7%	Amarillo, Centennial, possibly Columbus	Pleasant, flowery, spicy, and citrusy. Can have a grapefruit flavor.
Celeia (Slovenia)	3-6%	Styrian Golding	Moderate and pleasant zesty bitterness with matching floral aroma, making its use widespread in both ale and lager brewing. Stores very well.
Centennial	8-11.5%	Cascade, possibly Columbus	Medium with floral and citrus tones.
El Dorado (U.S.)	14-16%		candy-like
Hallertauer Mittelfrüh (German)	3-5.5%	German Tradition, Liberty, Ultra	Mild and pleasant.
Hallertauer Tradition (German)	3.5-5.5%	Crystal, Liberty	Known for its aromatic properties. A replacement for Hallertauer Mittelfrüh.
Hersbrucker (German)	3-5.5%	French Strisslespalt, Mt. Hood	Mild to semi-strong, pleasant, hoppy.
Horizon	11-14%	Magnum	Pleasantly hoppy.
Liberty	3-6%	Hallertauer, Hallertauer Tradition, Mt. Hood	Mild and clean aroma, slightly spicy character.
Magnum (German)	12-16%	Northdown, Northern Brewer	Known for bittering value and quality.
Magnum (U.S.)	10-14%	Northdown, Northern Brewer	High alpha variety
Mt. Hood	3-8%	Crystal, French Strisslespalt, Hersbrucker	Mild, pleasant, and clean, somewhat pungent and resiny.
Mt. Rainier	5-8.1%	Hallertauer	only available in 2012

<div> <div>Light Ale</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
(U.S.)			
Northern Brewer (German)	7-10%	Chinook, U.S. Northern Brewer	Medium-strong with some wild tones.
Northern Brewer (U.S.)	6-10%	Chinook, Nugget	Medium-strong with some wild tones.
Northwest Golding	4-5%		Known for aromatic properties.
Opal (German)	5-8%	Styrian Golding	German dual-purpose hop
Palisade	5.5-9.5%	Perhaps Cascade	Some "American" characteristics.
Perle (German)	6-8.5%	Northern Brewer, U.S. Perle	Moderately intense, good and hoppy, fruity and a little spicy.
Perle (U.S.)	6-9.5%	Chinook, Cluster, Galena, Northern Brewer	Known for its aromatic and bittering properties, pleasant and slightly spicy.
Pilgrim (U.K.)	9-13%	U.K. Challenger, U.K. Target	
Saaz (Czech)	3-4.5%	U.S. Saaz	Very mild with pleasant hoppy notes, earthy, spicy, and herbal.
Saaz (U.S.)	3-5%	Czech Saaz	Mild and pleasant, earthy and spicy.
Santiam	5-7.9%	German Spalt, German Spalt Select, German Tettnanger	Noble characteristics.
Saphir (German)	2.5-4.5%	Any noble hops	Mild aroma hop.
Simcoe	12-14%		A bittering and aromatic hop.
Smaragd (German)	4-6%		fine aroma
Sorachi Ace (Japan)	13-16%		Bittering hop with lemony aroma
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor

<div> <div>Light Ale</div> <div></div> </div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Spalt (German)	4-5.5%	German Spalt Select, U.S. Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy.
Spalt Select (German)	4-6%	German Spalt, U.S. Saaz, U.S. Tettnanger	Very fine Spalter-type aroma.
Spalt Select (U.S.)	3-5%	Saaz, Tettnanger	Medium intensity and pleasant hoppy qualities. Medium-strong aroma with wild American tones.
Sterling	6-9%	Saaz	Herbal, spicy, pleasant aroma, hint of floral and citrus.
Strisslespalt (France)	3-5%	Crystal, Hersbrucker, Mt. Hood	Medium intensity, pleasant, hoppy.
Target (U.K.)	9.5-12.5%	Fuggie, Willamette	Pleasant English hop aroma, quite intense.
Taurus (German)	12-17%	Magnum	high-alpha hop
Tettnanger (German)	3.5-5.5%	German Spalt, German Spalt Select, Saaz, U.S. Tettnanger	Mild and pleasant, slightly spicy, herbal.
Tettnanger (U.S.)	3.4-5.2%	Czech Saaz, German Spalt, Santiam	An aromatic hop, mild and slightly spicy.
Tradition (German)	5-7%	Hallertauer Mittelfrüh, Hersbrucker	Very fine and similar to Hallertauer Mittelfrüh.
Ultra	2-4.1%	Hallertauer Tradition, Liberty, Saaz	Very good to outstanding, some Saaz-like qualities. Aromatic properties similar to Hallertauer.
Vanguard	4-5.7%	Hallertauer Mittelfrüh, Saaz	Aroma similar to continental European types.

<div>Mead▼</div>			
Name	Alpha Acid %	Possible Substitutions	Flavor Description
Boadicea (U.K.)	8-9%		spicy
El Dorado (U.S.)	14-16%		candy-like
Sovereign (U.K.)	5-6%	U.K. Fuggle	mild flavor