



## Foreword

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No other raw material used in brewing has such a great influence on the aroma, flavour and bitterness of the beer as hops. And no other raw material has as many aromas as hops. And yet, until now we have confined ourselves to grouping hop varieties into aroma varieties and bitter varieties and to using hops accordingly in the brewing process. But does this classification make any sense? Craft brewers in America have discovered brewing anew and, along with it, the use of hops for beer. They are throwing all the old rules overboard and are treating aroma varieties and bitter varieties equally, i.e. as flavouring agents for the beer!

In the last few years, there has been a growth in the number of brewers who wish to rediscover hops in order better to differentiate their beers. They want to know not only the alpha or oil content; they are interested not only in technical values. What they want to know is how the hops smell, what aromas they have and what effect these aromas may have on the finished beer. We have been using hops for brewing for more than a thousand years and yet our descriptions of hop aromas are almost exclusively restricted to terms such as hoppy, spicy, floral and fruity!

Joh. Barth & Sohn, the leading provider of hop-related services, has therefore cooperated closely with two world champion beer sommeliers and a perfumist to itemise and describe in detail the aromas of the most important hop varieties. What we found were unique aromas. Each hop variety has its very own aroma composition – and each hop variety changes a beer's flavour. The original hop aroma is, of course, only a starting point, but those who know the hop aromas and their effects can also arouse enthusiasm among their customers for nuanced beers.

Join us in discovering hops and their incomparable aromas – in the interests of beer and of your customers!

Stephan J. Barth

PS: This project would not have been possible without our pioneers Dr. Christina Schönberger, the perfumist Frank Rittler and the two world champion sommeliers Karl Schiffner and Sebastian Priller-Riegele. Thanks to them for that – and, by the way, there are many more hop varieties whose aromas are waiting to be “discovered” in volumes II and III.

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Vermouth  
Curry  
Celeriac  
Green tea  
Hay



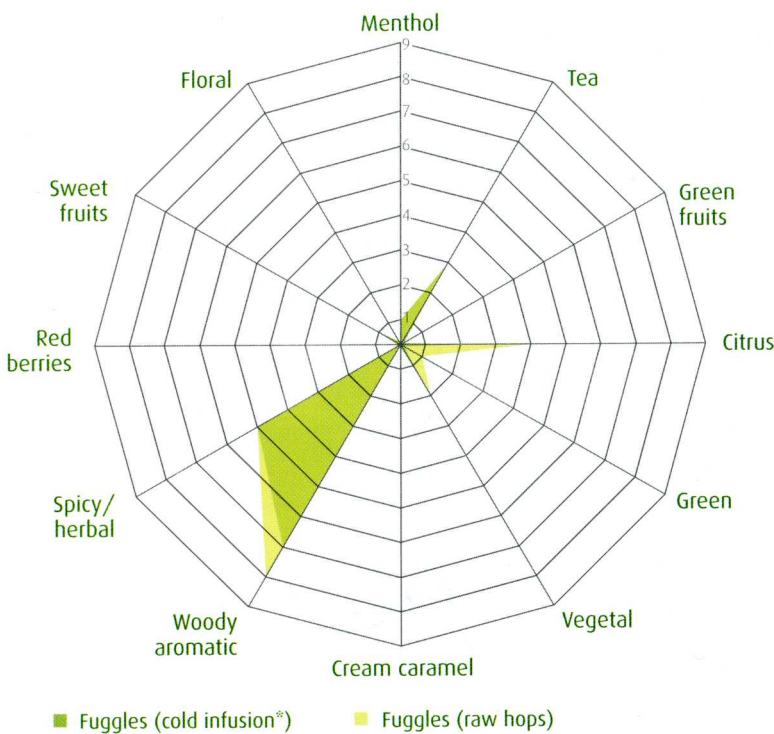
# Fuggles

UK



Probably the best-known and most popular aroma-type hop for English ales, this variety owes its appeal to its mild and spicy character.

Both in the raw hops and in the cold infusion, the predominant flavour components in Fuggles have a woody spiciness like tonka beans, cognac, hay and curry. Light nuances of green tea, cress and celeriac add a fresh note.



Descriptor	This includes the following aromas:
Menthol	Mint, melissa, sage, metallic, camphor
Tea	Green tea, camomile tea, black tea
Green fruits	Pear, quince, apple, gooseberry, wine yeast, ethereal
Citrus	Grapefruit, orange, lime, lemon, bergamot, lemon grass, ginger
Green	Green-grassy, tomato leaves, green peppers
Vegetal	Celeriac, leek, onion, artichoke, garlic, wild garlic
Cream caramel	Butter, chocolate, yoghurt, gingerbread, honey, cream, caramel, toffee, coffee
Woody aromatic	Tobacco, cognac, barrique, hay, leather, tonka, woodruff, incense, myrrh, resin
Spicy/herbal	Lovage, pepper, chilli, curry, juniper, marjoram, tarragon, dill, lavender, aniseed, liquorice, fennel
Red berries	Cassis, blueberries, raspberries, blackberries, strawberries
Sweet fruits	Banana, watermelon, honeydew melon, peach, apricot, passion fruit, lychee, dried fruit, plum, pineapple, white jelly bears
Floral	Elderflower, camomile blossom, lily of the valley, jasmine, apple blossom, rose, geranium

\* for the cold infusion 2 gr of pellets was dissolved to 200 ml water (20 °C) for 30 min and subsequently evaluated in order to simulate to some extent the change in aroma through dry hopping.

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## Analytical values

Maturity	medium-early
Growing regions	UK
Yield (kilos per hectare)	1500
Yield (lbs per acre)	1338
Alpha acids*	3.0 – 5.6 % by weight
Beta acids	2.0 – 3.0 % by weight
Alpha/beta ratio	1.0 – 2.8
Cohumulone	25 – 30 % of the alpha acids
Colupulone	50 – 54 % of the beta acids
Xanthohumol	0.3 %
Total oil	0.7 – 1.4 ml/100 g
Myrcene	24 – 28
Linalool	0.5 – 0.7 % of total oil
Beta-caryophyllene	9.0 – 13.0 % of total oil
Humulene	30 – 38 % of total oil
Farnesene	5.0 – 7.0 % of total oil
Beta-selinenes	1.1 – 1.3 % of total oil
Alpha-selinenes	1.1 – 1.3 % of total oil

The analytical values are typical for the variety at the time of harvest, but may vary according to crop year, growing region, grower and degree of ageing.

\* The alpha content is determined by means of spectrophotometric analysis

You can formulate your own flavour impressions here:

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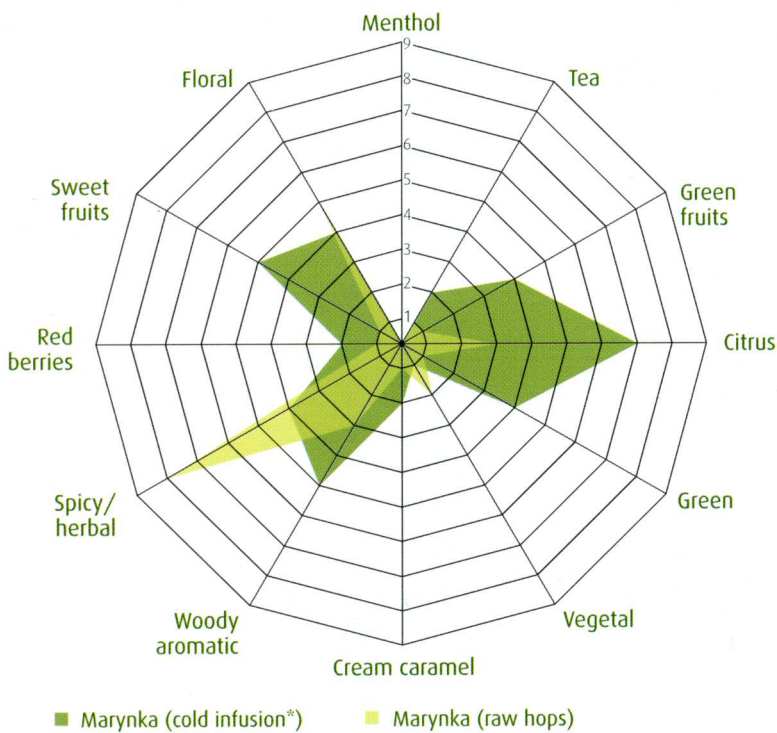
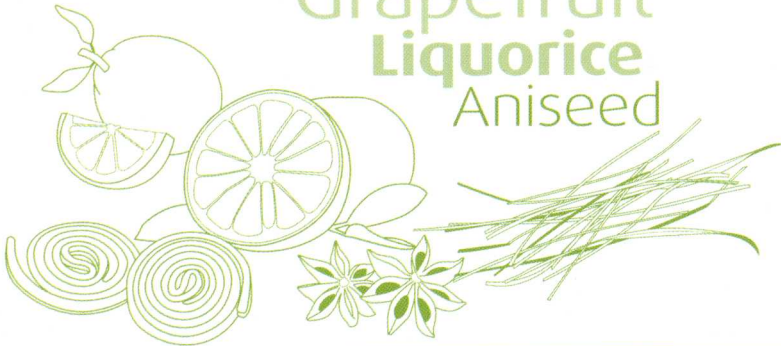
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# Marynka

Poland



Citrus  
Hay  
Grapefruit  
Liquorice  
Aniseed



This variety is popular due to its aroma characteristics but also on account of its bitter characteristics.

In its raw state, the Marynka hop displays exceptional spiciness, with notes of liquorice, aniseed and fennel, combined with floral and citrus-like flavour elements. In the cold infusion, these aromas are also strongly expressed in iris, grapefruit and lemon, coupled with nuances of sweet lychee fruits.

Descriptor	This includes the following aromas:
Menthol	Mint, melissa, sage, metallic, camphor
Tea	Green tea, camomile tea, black tea
Green fruits	Pear, quince, apple, gooseberry, wine yeast, ethereal
Citrus	Grapefruit, orange, lime, lemon, bergamot, lemon grass, ginger
Green	Green-grassy, tomato leaves, green peppers
Vegetal	Celeriac, leek, onion, artichoke, garlic, wild garlic
Cream caramel	Butter, chocolate, yoghurt, gingerbread, honey, cream, caramel, toffee, coffee
Woody aromatic	Tobacco, cognac, barrique, hay, leather, tonka, woodruff, incense, myrrh, resin
Spicy/herbal	Lovage, pepper, chilli, curry, juniper, marjoram, tarragon, dill, lavender, aniseed, liquorice, fennel
Red berries	Cassis, blueberries, raspberries, blackberries, strawberries
Sweet fruits	Banana, watermelon, honeydew melon, peach, apricot, passion fruit, lychee, dried fruit, plum, pineapple, white jelly bears
Floral	Elderflower, camomile blossom, lily of the valley, jasmine, apple blossom, rose, geranium

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## Analytical values

Maturity	early to medium
Growing regions	Poland
Yield (kilos per hectare)	2200
Yield (lbs per acre)	1963
Alpha acids*	6.0 – 12.0 % by weight
Beta acids	10.2 – 13.0 % by weight
Alpha/beta ratio	0.7 – 1.2
Cohumulone	26 – 33 % of the alpha acids
Total oil	1.8 – 2.2 ml/100 g
Myrcene	28 – 31 % of total oil
Humulene	26 – 33 % of total oil
Farnesene	1.8 – 2.2 % of total oil

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Cognac  
Caramel  
Elderberry  
Tobacco  
Vanilla

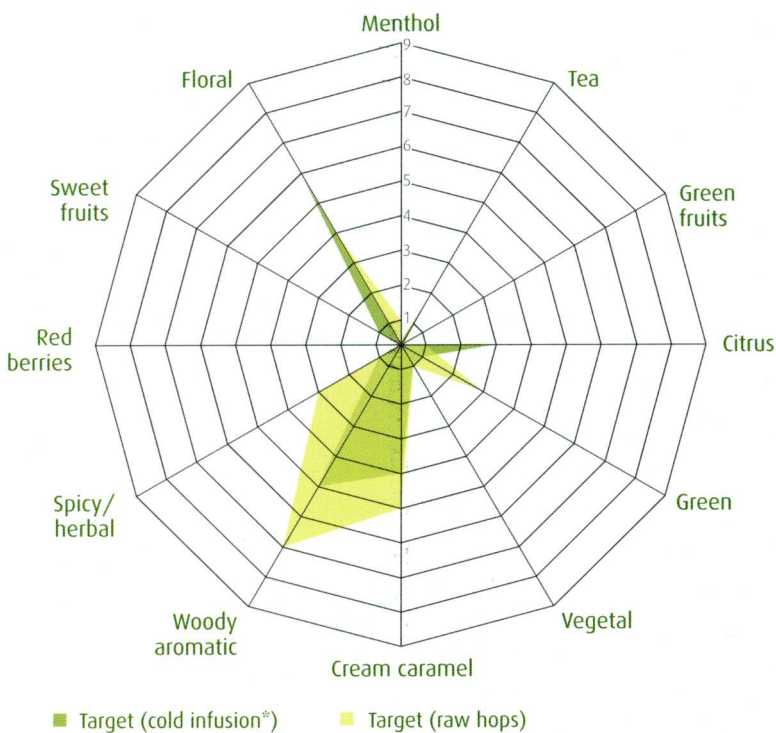
# Target

UK



Target has a very high bittering value and optimum storage stability.

Its aroma in its raw state is defined by the woody flavours of tobacco leaves, cognac, barrique and tonka beans, combined with light vanilla notes. In the cold infusion, the aromas of elderflower and citrus contribute to this cultivar's overall flavour impression.



Descriptor	This includes the following aromas:
Menthol	Mint, melissa, sage, metallic, camphor
Tea	Green tea, camomile tea, black tea
Green fruits	Pear, quince, apple, gooseberry, wine yeast, ethereal
Citrus	Grapefruit, orange, lime, lemon, bergamot, lemon grass, ginger
Green	Green-grassy, tomato leaves, green peppers
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Its aroma in its raw state is defined by the woody flavours of tobacco leaves, cognac, barrique and tonka beans, combined with light vanilla notes. In the cold infusion, the aromas of elderflower and citrus contribute to this cultivar's overall flavour impression.

## Analytical values

Maturity	late
Growing regions	UK
Yield (kilos per hectare)	1750
Yield (lbs per acre)	1561
Alpha acids*	9.5 – 12.5 % by weight
Beta acids	4.3 – 5.7 % by weight
Alpha/beta ratio	1.7 – 2.9
Cohumulone	35 – 40 % of alpha acids
Colupulone	57 – 62 % of the beta acids
Xanthohumol	0.8 %
Total oil	1.2 – 1.4 ml/100 g
Myrcene	45 – 55 % of total oil
Linalool	0.8 – 1.0 %
Beta-caryophyllene	8 – 10 % of total oil
Humulene	17 – 22 % of total oil
Farnesene	< 1 % of total oil
Beta-selinenes	0.7 – 1.8 % of total oil
Alpha-selinenes	0.7 – 1.8 % of total oil

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