

# Description and Classification of Two "New" Huell Aroma Breeding Varieties



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## INTRODUCTION

At present new hop varieties with unique aroma and flavour are popping up like flowers at springtime. But many of those are emerging from a rush job in order not to miss the "Flavour Hop Train". However, it must not be forgotten that there might be a need for classical aroma varieties as well in the future, no matter if quality, efficiency (aroma yield), yield (kg/ha) or disease and climate tolerance will be the driving factors.

Although a lot of new flavour varieties were released by the Hop Research Center in Huell, Bavaria, the last few years (*Polaris, Mandarina Bavaria, Huell Melon, Hallertau Blanc, Ariana* and *Callista*) there are still promising "normal" aroma breeding lines in the experimental gardens that have a number only. On two of those we want to draw your attention to: **89/002/025** and **96/001/024**.

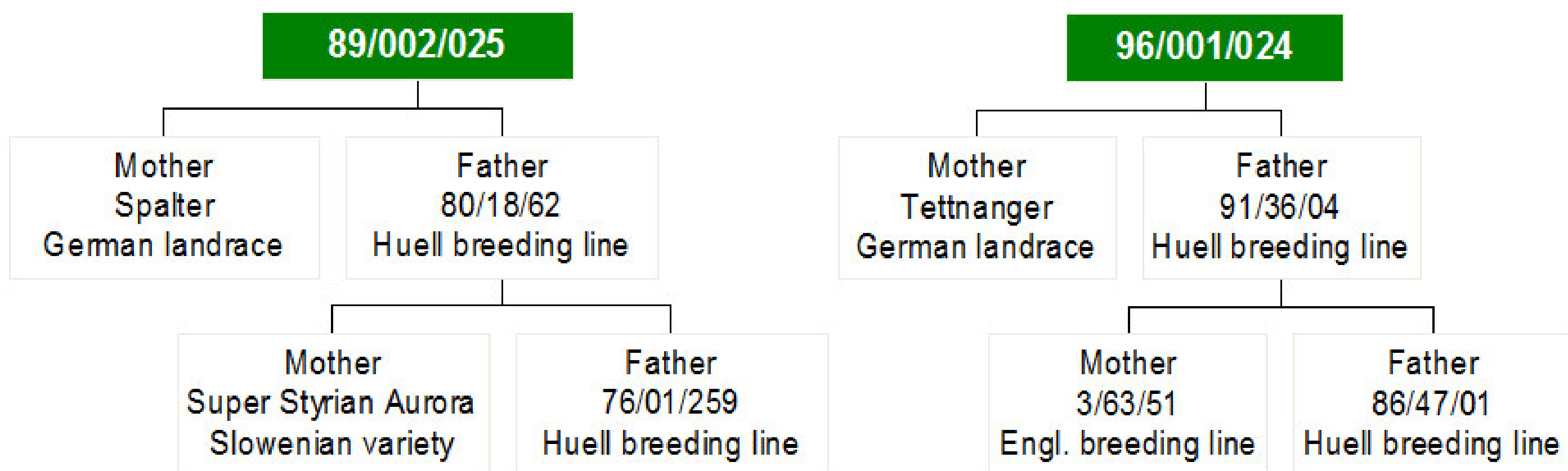


Figure 1: Pedigree of 89/002/025 and 96/001/024

## HOP ANALYSES

		89/25	96/24	SSP	TTE	HSR
<b>α-acids</b>	% w/w	5.3	4.1	3.7	3.3	2.8
<b>β : α</b>		0.89	1.00	1.86	1.55	2.11
<b>Cohumulone ratio</b>	% rel.	22	23	26	25	14
<b>Hop oil</b>	ml/100g	1.70	1.75	0.70	0.60	0.95

Table 1 : Basic Hop Analyses of the two experimental varieties compared to the two mother varieties *Tettnanger* (TTE) and *Spalter* (SSP) as well as to *Saphir* (HSR), the aroma variety with the highest aroma capacity yet.

		89/25	96/24	SSP	TTE	HSR
<b>Xathohumulol</b>	% w/w	0.42	0.44	0.46	0.32	0.38
<b>Sum of low molecular-weight polyphenols (LM)</b>	mg/100g	1181	1007	1777	1756	1837
<b>Total polyphenols (TP)</b>	% w/w	5.7	5.7	6.4	6.5	6.7
<b>LM : TP</b>	%	21%	18%	28%	27%	27%

Table 2 : Hop Polyphenol Analyses; LM:TP ratio = indicator for low molecular character of the polyphenols

		89/25	96/24	SSP	TTE	HSR
<b>Sum of Monoterpenes (MT)</b>	mg/100g	733	659	340	248	342
<b>Sum of Sesquiterpenes (ST)</b>	mg/100g	353	478	195	191	204
<b>Hydrocarbon fraction (HCF)</b>	mg/100g	1086	1137	535	438	546
<b>Farnesen (%) of ST</b>	mg/100g	26	3	29	29	7
<b>Sum of 6 Esters</b>	mg/100g	54	18	12	5	37
<b>Linalool</b>	mg/100g	17	12	6	5	7
<b>Geraniol</b>	mg/100g	2	2	6	4	2
<b>Sum of 4 Epoxides</b>	mg/100g	10	9	19	14	21
<b>Oxygen fraction (OF)</b>	mg/100g	129	95	71	54	132

Table 3 : Hop Aroma Substance Analyses

Major differences: 89/25 and 96/24 lower in total and low molecular polyphenols, but high aroma capacity (total oil, oxygen fraction, linalool).

## BREWING TRIALS

- 2-hl research brewery in St. Johann, Germany
- 100% malt, infusion, 12 % original extract
- Bitter hop addition begin of boil: *Herkules* pellets (to 20 IBU)
- Late hop addition according to oil content (6 ml/hl)
- Bottom fermentation with yeast strain W34/70
- Fermentation 8°C, maturation 14°C, cold conditioning 0-1°C
- Kieselguhr filtration, low-oxygen bottling



Dosing 6 ml of oil/hl results in:		89/25	96/24	SSP	TTE	HSR	Max : Min
<b>Amount</b>	g/hl	353	343	857	1000	632	2.9
<b>α-acids</b>	mg/l	187	141	317	330	177	2.3
<b>Oxygen fraction</b>	mg/hl	455	328	609	540	771	2.4
<b>Linalool</b>	mg/hl	60	41	51	50	44	1.5

Table 4 : Dosed amounts of other criteria and ratio max/min

## BEER ANALYSES

Original extract, alcohol, app. extract, degree of fermentation and pH show good reproducibility with variation coefficients of 0.8 to 1.9 % and are therefore not shown. Iso-α-acids vary moderately from 13 to 15 mg/l and the bitterness from 18 to 22 IBU.

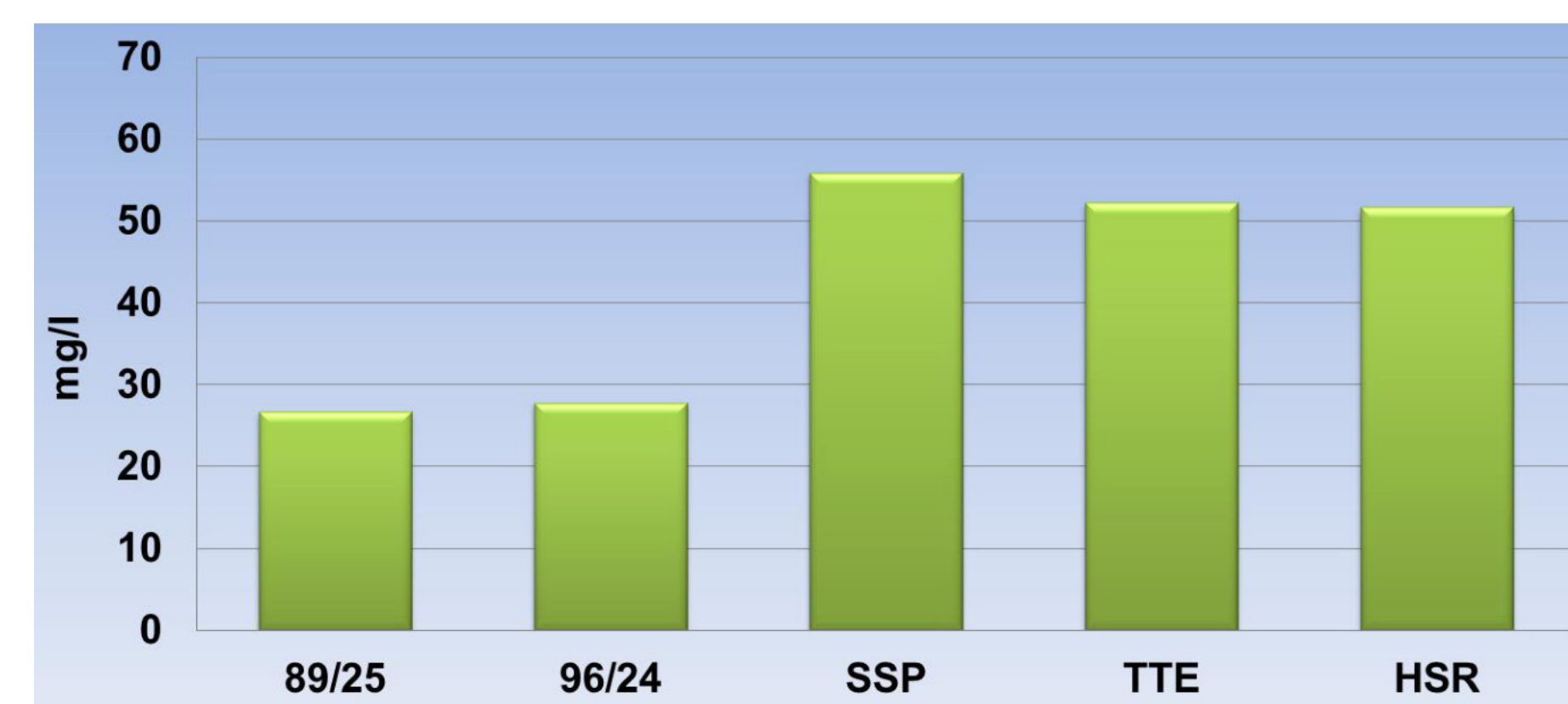


Figure 3 : Beer analyses (hop derived low molecular polyphenols)

- 89/25 and 96/24 significantly lower in hop derived low molecular (LM) polyphenols mostly as a result of lower dose of hop amount (s. Tab. 2 and 4)

- 89/25 significant higher linalool content in beer; beer values follow dose rates.



Figure 4: Beer analyses (Total Linalool); Ratio of S-Linalool = approx. 10% = const.

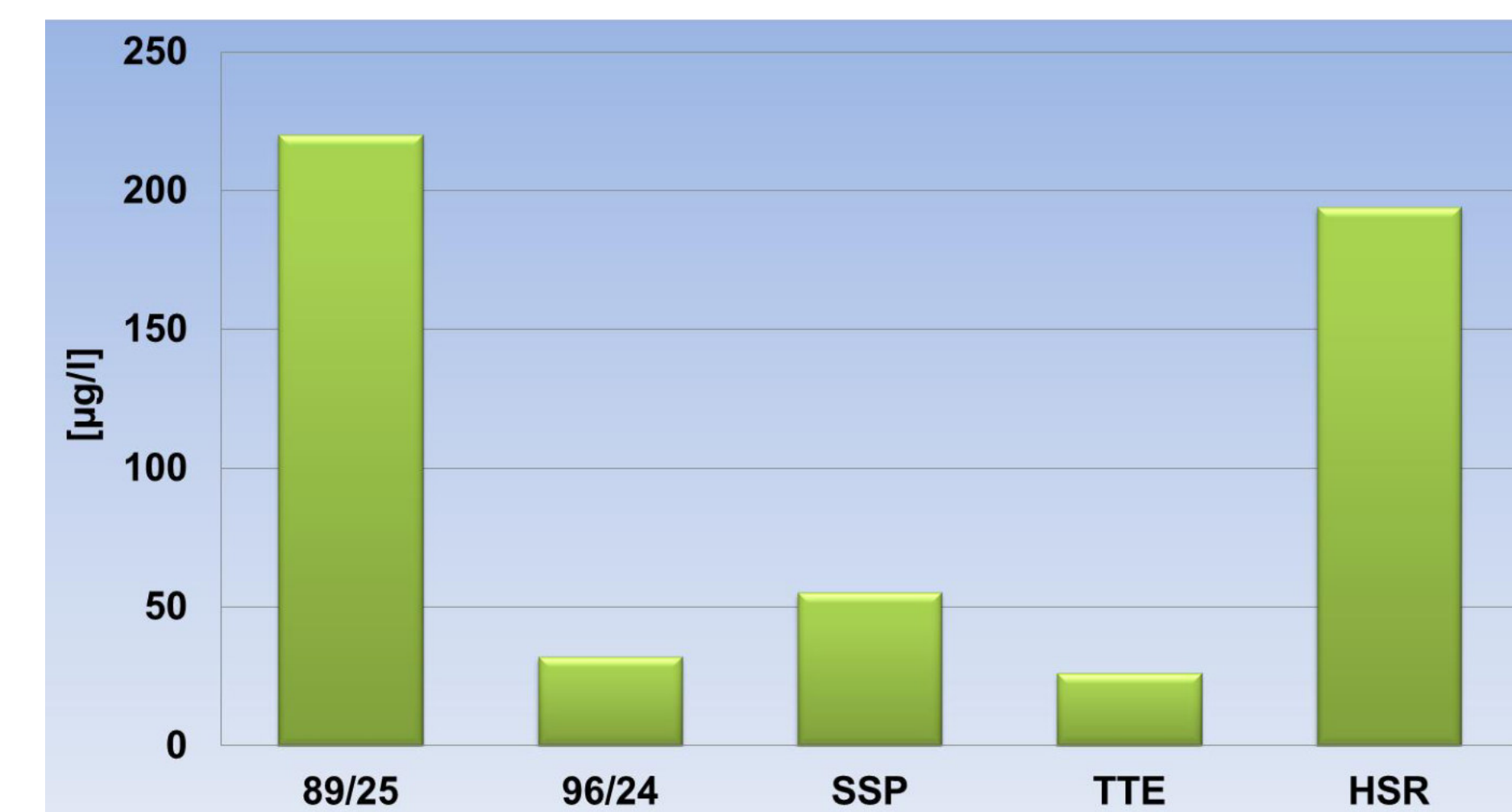


Figure 5: Beer analyses (Sum of 6 Esters)

- 89/25 highest ester content in beer, HSR has high levels as well
- single components can exceed their threshold level

## SENSORY ANALYSES

Beers were tasted by the St. Johann taste panel (s. table 5, figure 6) and a small consumer panel, where 89/25 has been preferred 6:1 to TTE and 5:2 to SSP).

	89/25	96/24	SSP	TTE	HSR
<b>DLG (average grade)</b>	4.47	4.27	4.48	4.41	4.21
<b>Preference</b>	1*	3	2	3	5

Table 5: Tasting Results (enhanced DLG form, St. Johann panel, n=13)

- good average marks for all beers
- 89/25 sign. preferred

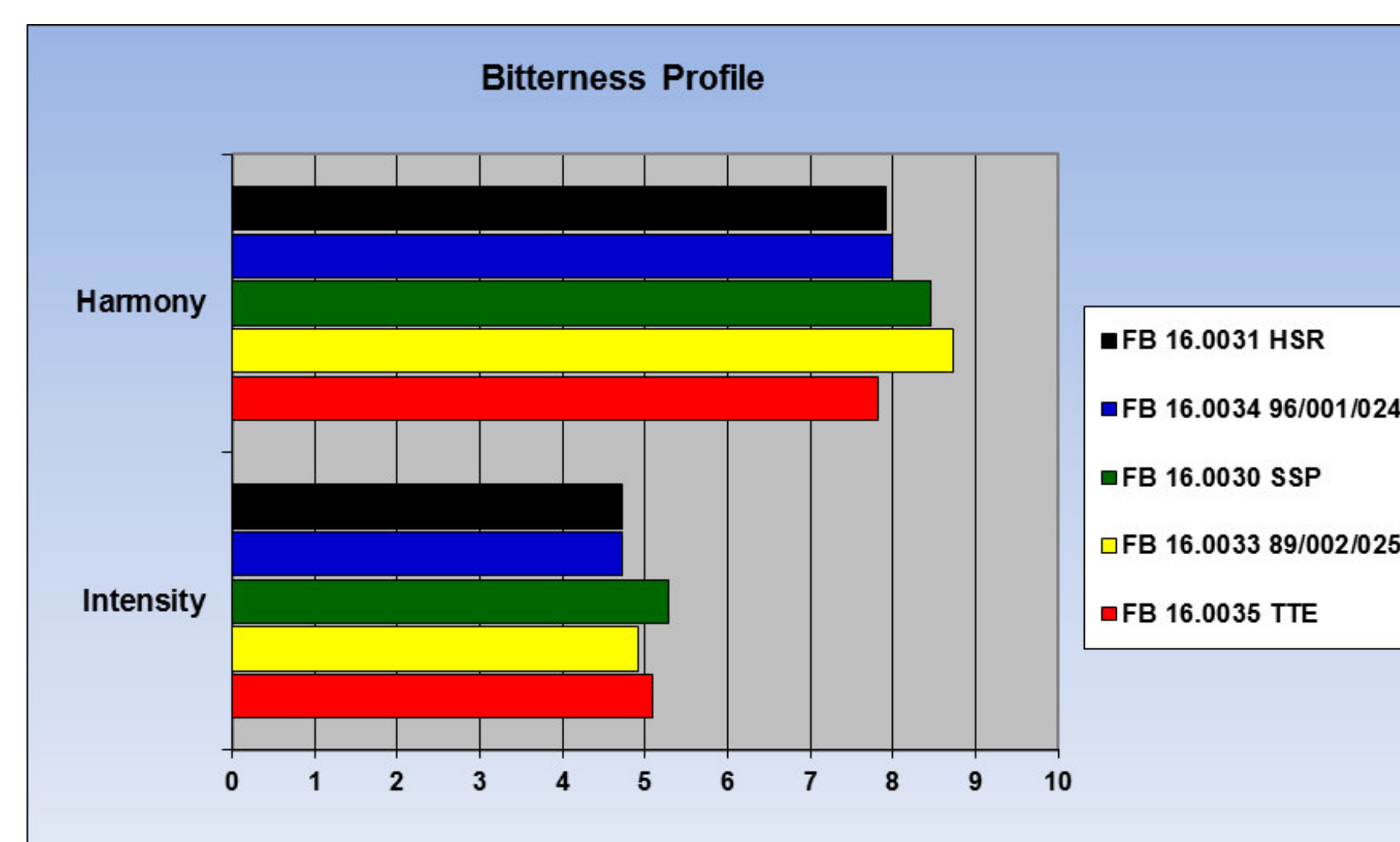


Figure 6: Tasting Results (bitterness profile, St. Johann panel, n=13)

- all beers on a comparable bitterness level (intensity)
- harmony (quality) of bitterness all beers were rated as fine, 89/25 and SSP by trend better

## SUMMARY

Two Huell aroma breeding varieties, 89/002/025 and 96/001/024 are compared to their mothers *Spalter* and *Tettnanger* as well as to *Saphir*, the aroma variety with the highest aroma capacity in Germany yet.

- Both breeds have reduced low molecular polyphenolic character compared to mother varieties.
- 89/25 shows a high farnesene content, an indicator for its affiliation to the Saaz hop family.
- Especially 89/25 is very rich in aroma substances of good solubility like linalool and esters.
- A dosage according to hop oil content resulted in a reduced throw of the breeding varieties: 35% of TTE, 41% of SSP and 55% of HSR.
- The 89/25 beer showed the highest values of flavour-active compounds (linalool and esters).
- Particularly 89/25 has been rated good in the tastings, the beer has been preferred significantly.
- These results are supplemented by two more test series varying the dosage criteria
- In order to achieve a comparable hop aroma in beer the breeding lines can be dosed at significantly lower quantities.
- Due to the results HVG has decided to grow both varieties on an amplified acreage this year: 89/25 on 3 ha and 96/24 on 1 ha.

**Especially 89/002/025 is a very promising candidate for a registration as a new aroma variety for late hopping purposes.**

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