Wine test results from clones of the varieties Kerner, Müller-Thurgau, Gewürztraminer and Riesling during the development and redevelopment phases

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Summary: In the field of clone development in the Mosel-Saar-Ruwer region, in 5 selection phases microvinifications were carried out. Included were the varieties Kerner, Gewürztraminer, Riesling and Müller-Thurgau. According to the harvest and wine data, the findings in the sensorial assessment of the wine, as well as the results of the correlation and regression analysis, the following was established:

1. There were differences in the harvest data.
2. There were differences in the sensory assessment.
3. The must weight alone as a selection criterion for wine quality was insignificant.

It is strongly recommended that a microvinification with at least 2 replicates should be carried out in each selection phase.

Key words: variety of vine, clone, selection, analysis, yield, must quality, wine quality, sensory rating, microvinification, Moselle.

Introduction

Vine selection in Germany began more than 200 years ago in 1787 (Schöffling and Faas, in print). Clonal selection started in 1876. The first clone vineyard was planned in 1900. Vine clones result from mutation and selection. Their development requires approximately 20 years (Schöffling 1989). It includes 4 test phases, as shown in Fig. 1. These are followed by a subsequent selection with a redevelopment, which undergoes 2 test phases (Fig. 2).

Today over 465 grapevine clones are available. They originated from 34 grapevine varieties. Their cultivation is managed by 54 clone breeders, of which 70 % are private and 30 % publicly funded.

Nearly all clones are virus-tested (compare Stellmach 1987). Their performance at harvest is examined (Faas and Schöffling 1986). While their harvest data are adequate, there is still a need for quality rating. A great deal of research work has been carried out on clones already released

Table 1: Varieties, test phases and locations of grapevines and clones

Variety	Vine (V) Clone (C)	Test phase	Location
Kerner	24 V	First -Selection (FS)	Wintrich
Gewürztraminer	5 C	Pre -Selection (PS)	Wormeldange
W. Riesling	5 C	Interim -Selection (IS)	Kanzem
Müller-Thurgau	5 C	Main -Selection (MS)	Köwerich
W. Riesling	5 C	Subsequent-Selection (SS)	Kanzem

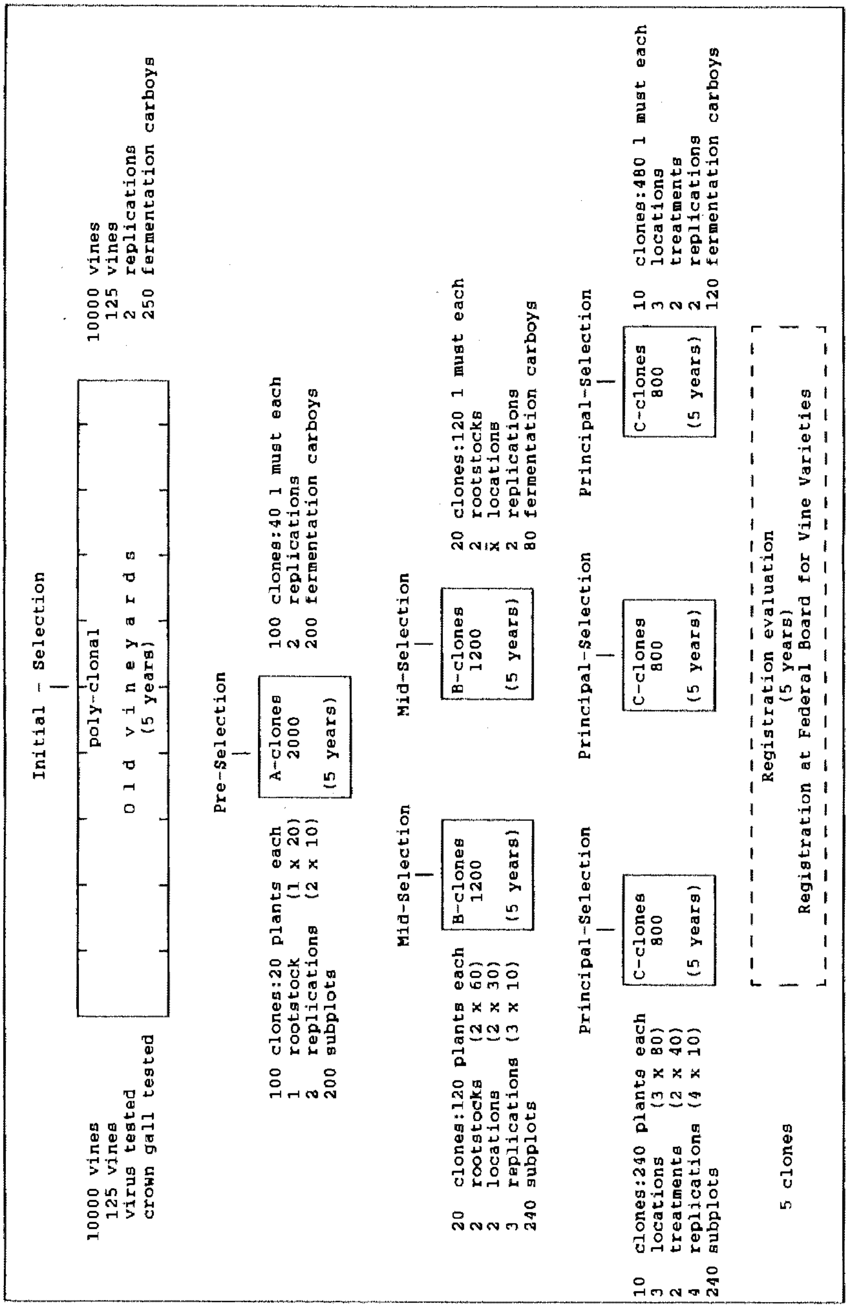

Fig. 1: Development within initial, pre-, interim and principal clonal selections. Duration: 20 years.

(Schöffling and Faber 1987; Rapp 1989). It relates to determination of wine quality sensorially and by gas chromatography. The results are encouraging.

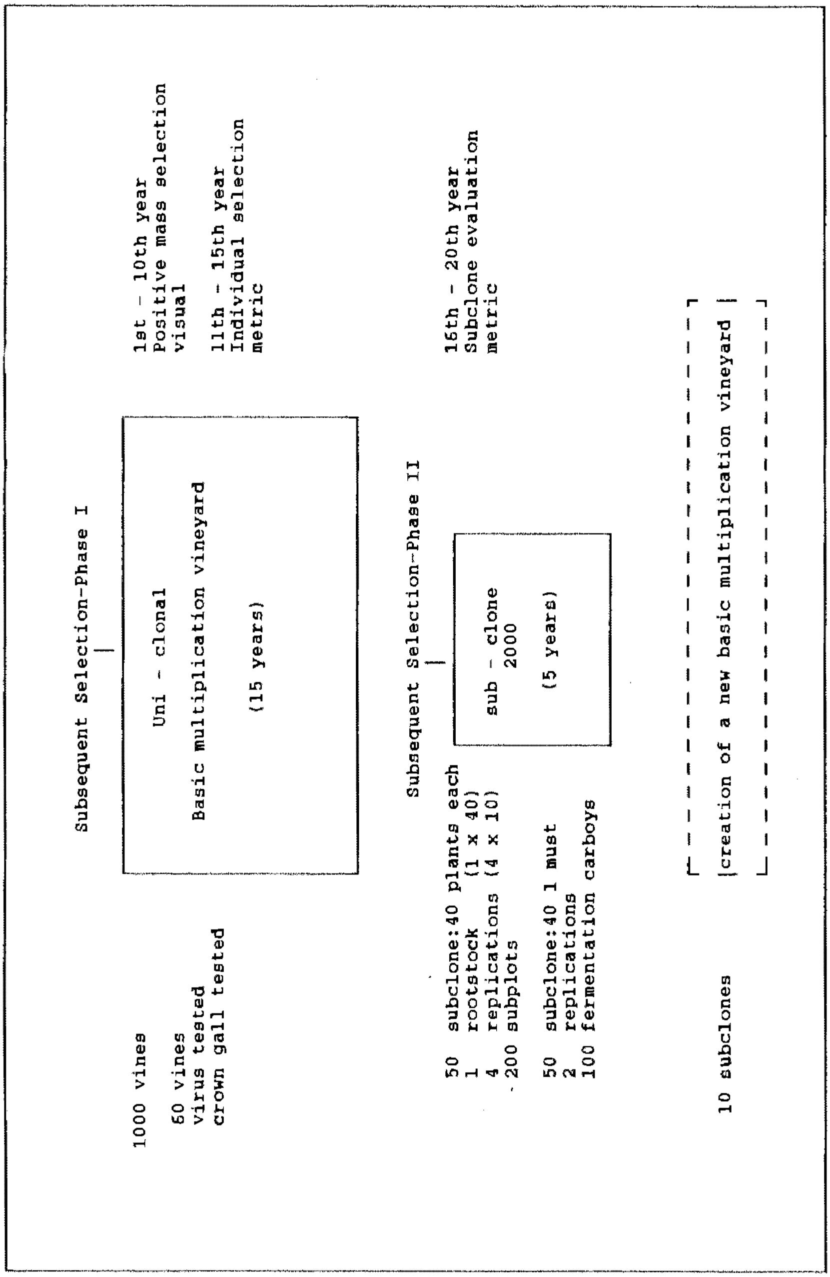

Fig. 2: Redevelopment within subsequent clonal selections, phase I and II. Duration: 20 years.

The experiments in question were carried out on clones which had not yet been released. We studied, by sensory evaluation, which differences arose in blind testings as a result of a certain number of chemicals present in very low concentrations in the clonal wines of the species *Vitis vinifera*. The varieties included are shown in Table 1.

Results

1. Harvest data

Table 2 shows a survey of the harvest data. Where possible, the values obtained were taken with replications. Naturally they showed great differences. In must weight they varied, according to the selection phase, between 4, 7, 9, 13 and 43 %.

2. Treatment of must

The musts were fermented with selected yeast, with 2 replicates. The experimental parameters are shown in Table 3.

Table 2: Harvest data ($\bar{x}$, maximum difference as %) of grapevines and clones in different test phases

Variety	Test	Year	Grape yield kg/vine bzw. kg/are		Must weight °Oe		Total acidity g/l		pH Value pH		Grape-rot %	
			$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%
Kerner	FS	1988	4.1	400	64.9	43	8.5	23	3.06	3	1.9	0
Gewürz-traminer	PS	1988	83.9	24	72.8	7	9.2	24	3.11	3	0.0	0
W. Riesling	IS	1985	142.4	46	60.2	9	15.0	17	2.83	7	0.0	0
Müller-Thurgau	MS	1988	197.4	28	67.6	13	6.5	6	3.27	2	18.4	64
W. Riesling	SS	1987	96.4	63	56.2	4	16.3	9	2.94	3	5.0	0

Table 3: Must treatment of grapevines and clones in different test phases

Variety	Test phase	Chaptalization	De-acidification	Fermentation
Kerner	FS	no	no	fermented out
Gewürztraminer	PS	increased by 16 g/l	no	fermented out
W. Riesling	IS	increased by 28 g/l	reduced to 9.5 g/l	fermented out
Müller-Thurgau	MS	increased by 20 g/l	no	fermented out
W. Riesling	SS	increased by 20 g/l	reduced to 9.0 g/l	fermented out

Table 4: Sensory data ($\bar{x}$, maximum difference as %) of grapevine and clone wines in different test phases

Variety	Judgement	Test	Year	Aroma 0-5		Taste 0-5		Harmony 0-5		Quality No. 0-5	
				$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%	$\bar{x}$	%
Kerner	22	FS	1988	2.11	280	2.06	473	2.01	415	2.49	372
Gewürz-traminer	30	PS	1988	2.56	12	2.47	10	2.44	9	2.50	9
W. Riesling	536	IS	1985	5.78	5	5.86	6	5.80	5	6.02	5
Müller-Thurgau	30	MS	1988	2.61	15	2.59	13	2.60	8	2.60	11
W. Riesling	102	SS	1987	2.82	18	2.72	14	2.63	17	2.72	15

Within the individual research groups, the same treatments were carried out. The residual sugar contents and the total acids varied around 1 g/l. Before bottling both replicates were combined together. In case of the variety Riesling, the replications were bottled separately. So we can conclude that the prerequisites are sufficient to allow a sensory evaluation of the wines.

3. Sensory data

Experts were brought in to make observations on the wine. We used the DLG 5-point scheme and in one case a 10-point scheme. The results are shown in Table 4.

The observations within the research groups have, to some extent, revealed great variations, especially in aroma.

Differences were ascertained by means of the F-test and the Duncan test. The analysis showed significant differences as presented in Table 5.

Out of 208 possibilities, 82 could be identified. That is about 40 %.

Table 5: Significant differences in grapevine and clone wines in different test phases

Variety	Test	Aroma n	Taste n	Harmony n	Quality No. n
Kerner	FS	13	10	12	12
Gewürztraminer	PS	–	–	–	–
W. Riesling	IS	5	4	4	6
Müller-Thurgau	MS	–	–	–	–
W. Riesling	SS	5	3	4	4

Table 6: Significant relationships between harvest and wine data, respectively, and sensory data in different test phases

x Must data Wine data	y Aroma F S	P S	I S	M S	S S	y Taste F S	P S	I S	M S	S S	y Harmony F S	P S	I S	M S	S S	y Quality No. F S	P S	I S	M S	S S	To-tal
Must																					
Grape yield				*	*				*	*				*	*			*	*	*	9
Must weight					*					*					*					*	4
Total acidity												*		*							2
pH-Value							*					*					*				3
Grape rot																					0
Wine																					
Alcohol	*				*					*		*								*	5
Residual extr.												*									1
Residual sugar			*				*	*					*				*				5
Total acidity			*					*				*	*	*				*	*		7
pH-Value	*							*										*			3
Total			8					9					12					10			39

4. Correlations

The sensory results were examined to determine a relationship between the harvest data and the wine data. The findings are shown in Table 6.

At first, in all selection phases correlations to the sensory evaluation were indicated. From 200 possible cases, however, only 39 were significant. That is around 20 %. These were apportioned half from the must data and half from the wine data. The highest number of correlations were found with the grape yield.

5. Regressions

The regression coefficients for the 39 relationships with selected parameters are shown in Table 7.

The first thing to recognize about the regression coefficients is that the wine was judged better when, for example, the grape yield and the acidity decreased. In about 50 % of possible cases this relationship applied. So far the results suggest a limitation of yield, which is carried out worldwide.

To which extent can must weights be valued as a quality factor ? – In German winemaking this is considered as an important criterion of quality. For example, the quality classification of the wine law is based on the must weight at harvest. The analogy of this is that the must weight has always played a leading role in the area of quality analysis in clonal selection. Thus, when so great a significance is attributed to the must weight in wine production, an equally close correlation had to be given to the sensory assessment. But only in 4 cases, that is 20 %, was the correlation found.

Table 7: Significant regression coefficients of the relationships between harvest and wine data, respectively, and sensory data (n = grapevines, clones or clones x replications) in different test phases

Relationship y x	Test	n	$\bar{y}$	Regressionanalysis $\bar{x}$	$r^2 = B$	a	byx
Aroma-Grape yield	MS	10	2.63	197.4	0.423*	3.69	-0.0054
Aroma-Grape yield	SS	10	2.82	96.4	0.679**	3.64	-0.0080
Aroma-Must weight	SS	10	2.82	56.2	0.686**	-7.80	0.1900
Aroma-Alcohol	FS	23	2.11	68.6	0.124*	0.07	0.0302
Aroma-Alcohol	SS	10	2.82	75.1	0.428*	-8.77	0.1540
Aroma-Residual sugar	IS	5	5.78	11.7	0.773*	2.48	0.2808
Aroma-Acidity (wine)	IS	5	5.78	7.9	0.929**	22.06	-2.0509
Aroma-pH-Value (wine)	FS	23	2.11	2.85	-0.130*	10.55	-2.9516
Taste-Grape yield	MS	10	2.60	197.4	0.527**	3.87	-0.0064
Taste-Grape yield	SS	10	2.72	96.4	0.806**	3.44	-0.0070
Taste-Must weight	SS	10	2.72	56.2	0.543**	-4.84	0.1300
Taste-pH-Value (must)	PS	5	2.47	3.11	0.736*	-4.89	2.3655
Taste-Alcohol	SS	10	2.72	75.1	0.298*	-5.02	0.1030
Taste-Residual sugar	IS	5	5.84	11.7	0.870**	2.15	0.3139
Taste-Residual sugar	PS	5	2.47	0.9	0.790*	1.74	0.7871
Taste-Acidity (wine)	IS	5	5.84	7.9	0.671*	20.40	-1.8341
Taste-pH-Value (wine)	IS	5	5.84	3.32	0.748*	9.24	-1.0232
Harmony-Grape yield	MS	10	2.61	197.4	0.494*	3.66	-0.0053
Harmony-Grape yield	SS	10	2.63	96.4	0.659**	3.29	-0.0070
Harmony-Must weight	SS	10	2.63	56.2	0.527**	-5.06	0.1400
Harmony-Acidity (must)	PS	5	2.44	9.2	0.834*	3.23	-0.0854
Harmony-Acidity (must)	MS	10	2.61	6.5	0.348*	6.33	-0.5725
Harmony-pH-Value (must)	PS	5	2.44	3.11	0.785*	-2.81	1.6885
Harmony-Alcohol	PS	5	2.44	95.3	0.743*	0.02	0.0254
Harmony-Residual extract	PS	5	2.44	6.5	0.920**	0.55	0.2931
Harmony-Residual sugar	IS	5	5.80	11.7	0.799*	2.13	0.3128
Hamrony-Acidity (wine)	PS	5	2.44	7.4	0.823*	3.25	-0.1085
Harmony-Acidity (wine)	IS	5	5.80	7.9	0.774*	22.08	-2.0507
Harmony-Acidity (wine)	MS	10	2.61	5.0	0.313*	5.33	-0.5430
Qual. No.-Grape yield	IS	5	6.01	171.0	0.686*	6.70	-0.0049
Qual. No.-Grape yield	MS	10	2.61	197.4	0.564**	3.74	-0.0057
Qual. No.-Grape yield	SS	10	2.72	96.4	0.778**	3.45	-0.0080
Qual. No.-Must weight	SS	10	2.72	56.2	0.645**	-5.86	0.1500
Qual. No.-pH-Value(must)	PS	5	2.49	3.11	0.714*	-3.34	1.8741
Qual. No.-Alcohol	SS	10	2.72	75.1	0.328*	-5.74	0.1130
Qual. No.-Residual sugar	PS	5	2.49	0.9	0.699*	1.94	0.5947
Qual. No.-Acidity (wine)	IS	5	6.01	7.9	0.704*	23.22	-2.1676
Qual. No.-Acidity (wine)	MS	10	2.61	5.0	0.336*	5.44	-0.5645
Qual. No.-pH-Value(wine)	IS	5	6.01	3.32	0.741*	9.91	-1.1744

The 4 regression lines which were found are laid out in Fig. 3. They are Riesling subclones from the internationally known Riesling clone Weis 21. With an increase of 1 °Oechsle they improve:

in the aroma	about 0.189 points
in the taste	about 0.135 points
in the harmony	about 0.137 points
in the quality no.	about 0.153 points.

These are small improvements which are seldom significant.

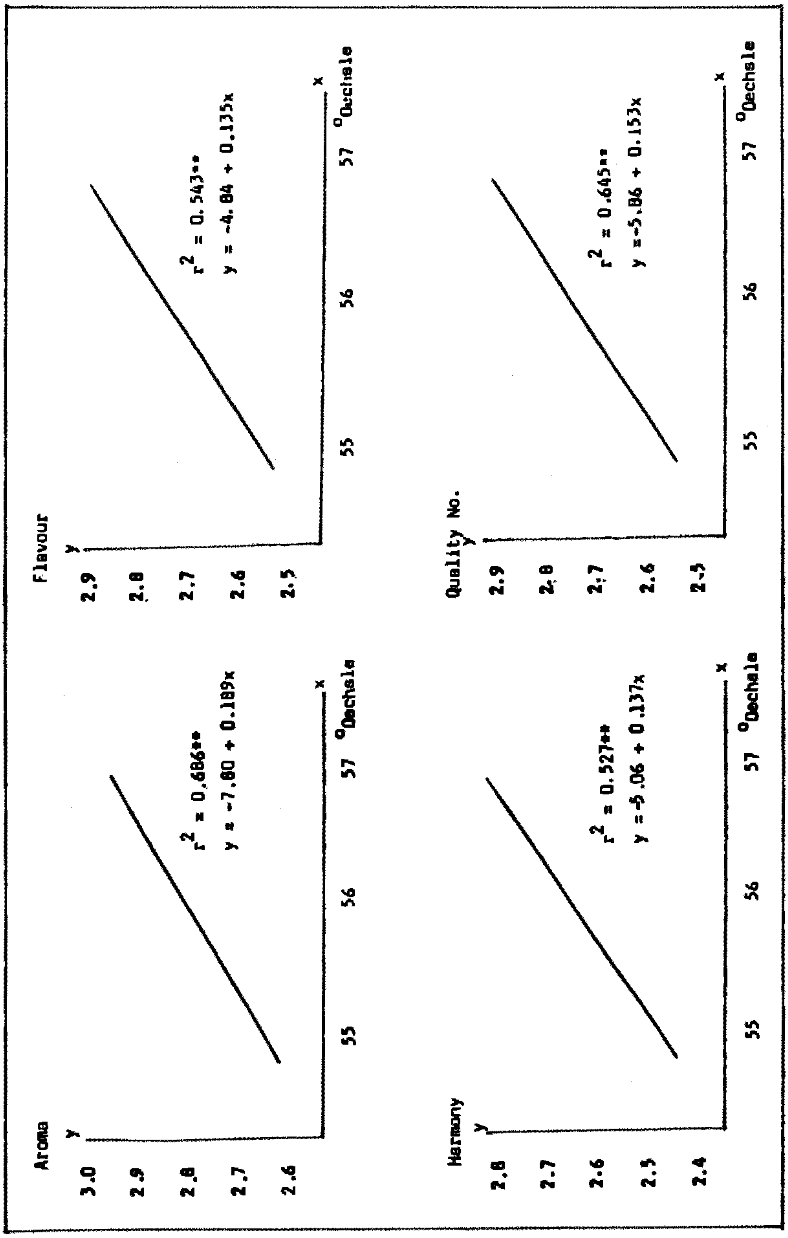

Fig. 3: Regression lines for the relationships between sensory data and must density within the subsequent selection phase II, 1987.

Table 8: Berry weight and other parameters from clones of the variety W. Riesling in the year 1988, as well as sensory data of the wines over 2 vintage years, from the location 'Staatsdomäne Trier-Avelsbach'

Clone	Harvest data			Quantity (n)			Weight (g)			Diameter (cm)	Sensory data
	Grape yield kg/vine	Must-weight °Oe	Total acidity g/l	Shoots per vine	Clusters per vine	Berries per Cluster	Cluster	Rachis	Berry		0 - 20
Weinsberg 29	1.595	81.7	10.5	15.3	23.9	78.7	66.85	2.95	0.64	11.5	13.27
Bernkastel 68	1.793	77.5	11.1	15.3	24.2	75.1	74.09	3.03	0.71		13.11
Neustadt 90	1.859	78.8	10.3	15.3	23.3	86.9	79.63	3.19	0.76		13.00
Trautwein 356	2.194	80.2	10.3	15.3	24.2	99.3	90.86	3.99	0.87		12.97
Heinz 65	2.473	76.4	10.6	15.3	25.2	102.7	98.03	3.59	0.94		12.53
Weis 21	2.595	76.5	12.0	15.4	24.9	107.2	104.24	4.26	1.00	12.3	12.21

Conclusion

It can be deduced from these data that we cannot rely only on must weights for determination of quality in clonal selection. There is no sure relationship between wine quality and must weight differences between clones. Therefore, sensorial wine assessment should be given preference. For this reason, we recommend urgently that in the single selection phases winemaking in 2 replicates should be undertaken. Research with berry size and gas chromatography should not be excluded in such a program because they can be used to indicate the clone quality (Table 8).

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Results of clonal selection with Blauer Frühburgunder (Early Pinot noir) at Geisenheim

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Abstract: Blauer Frühburgunder (Early Pinot noir) is part of the varietal group of Pinot cultivars. The variety has been well known for a long time as being very early ripening in Germany. Ampelographically Frühburgunder is close related to Pinot noir (Blauer Spätburgunder) and has nearly the same characteristics. Wines of Frühburgunder are full-bodied, of good colour and produce very good quality red wines. The wines of this Pinot type need no chaptalization even in cool climate viticulture. But the variety is degenerated and virus infected. This was the reason for its almost entire disappearance in Germany.

At Geisenheim, we selected for more than 20 years Frühburgunder. Many clones were obtained and evaluated. Most of them proved in comparison to Blauer Spätburgunder to be infected with leafroll virus in connection with low yields. In the process of selection we evaluated new clones and found them to be free of virus. The yields of these new Geisenheim clones of Blauer Frühburgunder are reasonable. The wines are of good colour, high quality and natural. No chaptalization is needed. The average yields of our selected Geisenheim clones of Blauer Frühburgunder are as follows: 1983-1987 8230 kg/ha – 81 °Oechsle, 8.6 ‰ total acidity. We started to propagate the best new Geisenheim clones of Blauer Frühburgunder grafted on virus tested rootstocks. The new Geisenheim clones of Blauer Frühburgunder are of great interest in Germany. First plantations had been already established.