8th International Cool Climate Symposium Tasmania
31 Jan - 4 Feb 2012

Disease resistant varieties and new clones for cool climate regions

Ir. Stan Beurskens (Msc)

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Disease TOLERANT varieties and new clones for cool climate regions

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Program

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- Introduction
- Development new varieties
- Present and future
- Several new varieties for cool climate regions
- Conclusion of new varieties
- Why are new clones needed?
- Examples of new clones

Experimental vineyard

Commercial vineyards

Research

- New varieties and clones for the cool climate regions. Chances in the development of their vinification and viticulture.
  - More than 70 new varieties have been tested
  - Over 40 clones of the classic grapes have been compared
  - Experiments with yeasts, methods and techniques with the new varieties
  - Viticulture experiments, diseases, growth, development

Where are the most new varieties and clones for the cool climate developed?

- Germany: the institutes of Freiburg, Geilweilerhof, Weinsberg and private breeders
- France: INRA and private breeders
- Switzerland: private breeders, e.g. Valetin Blattner
- Canada and USA

Breeding activity e.g. in Germany

- **Breeding for resistance**
  - wine grapes since 1934
  - rootstock varieties since 1922
  - table grapes
- **Clonal selection**
  - wine grapes since 1901
  - rootstock varieties since 1950

Why new varieties?

- **Environmental friendly**
  - Less use of fungicides against botrytis, powdery and downy mildew
- **Frost resistance**
- **Nematodes (Newest disease tolerant varieties)**
- **Earlier development of the grapes**
  - Time of bud break, e.g. later in areas where frost is a problem
  - Time of flowering
  - Time of veraison
  - Earlier harvest or later

Genetic pool for breeding of resistant varieties e.g. in Freiburg

since 1934

American Euvitis Gen-Pool

2 n = 38

resistance

against ***- powdery mildew***

- downy mildew

(z.B. Vitis rupestris, Vitis cinerea)

since 1975

Asian Euvitis Gen-Pool

2 n = 38

resistance

against ***- powdery mildew***

- downy mildew

- frost

(z.B. Vitis amurensis)

since 2004

Muscadinia Gen-Pool

2 n = 40

resistance

against ***- powdery mildew***

- downy mildew

- nematodes at rootstocks

(z.B. Vitis rotundifolia, Vitis munsoniana)

Vitis vinifera

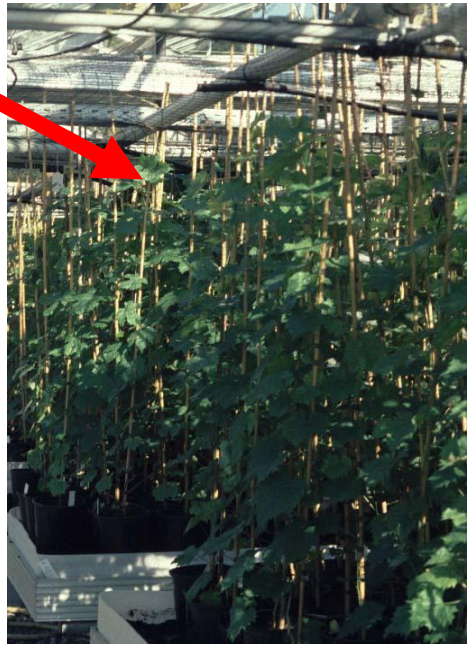
(european and asiatic Vitis

(Vitis vinifera ssp. silvestris)

Cultivation of seedlings and biotest with downey and powdery mildew

Seedling-cultivation in greenhouse

3-6% survivals after 12 weeks of testing infection in greenhouse



Reaction of resistance against downy mildew

Powdery- mildew infection for 6 weeks

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Biology and development of breeding

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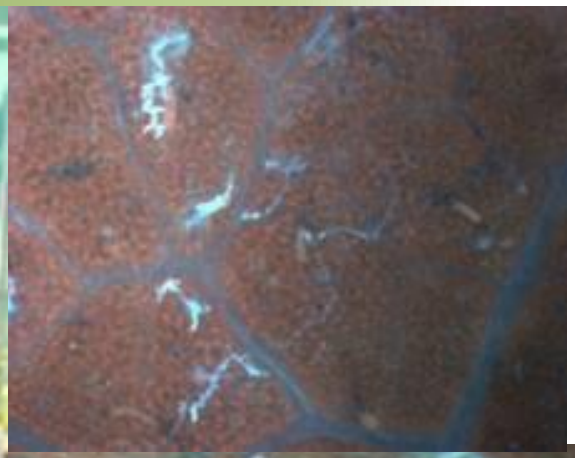

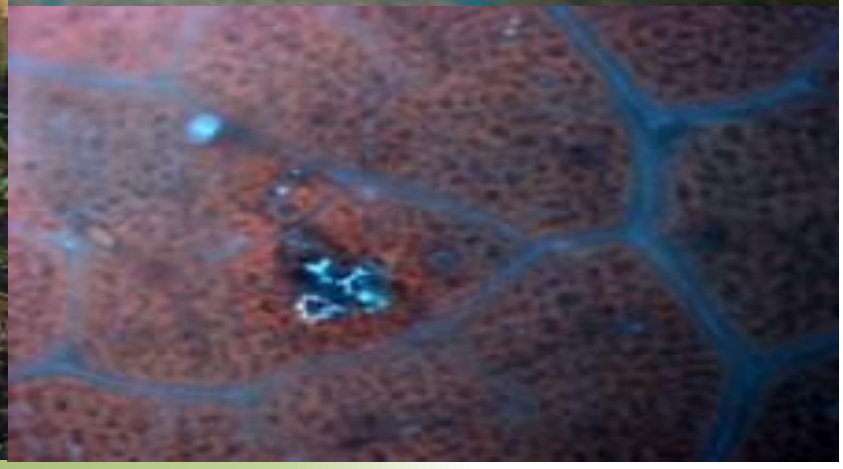

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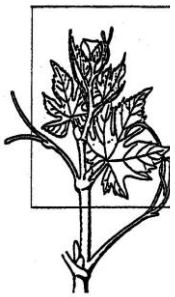
Variety-criteria according to UPOV-convention

3.	53 – 69 O – 001 I-6.1.1	Young shoot: openness of tip	Jeune rameau: ouverture de l'extrémité	Junger Trieb : Öffnung der Triebspitze	Pámpano: apertura de la extremidad		
		closed	fermée	geschlossen	cerrado	*Vitis rupestris*	1 
		fully open	complètement ouverte	vollständig offen	completamente abierto	*Vitis vinifera*	5 

Kober 125 AA

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Cabernet sauvignon

Prior

How long does it take?

Step of work	timetable	number of plants	comments
aim of breeding	0	2 [♀ x ♂]	resistance against diseases (Pero, Oid., Botr. etc.)
flower manipulation	0	(2)	volume depends on breeding aims
harvesting	0	(2)	at motherplant (♀) some days before ripeness
sawing seeds	0/1		each seed theoretically a new variety
germinating greenhouse	III / IV 1	1	22-25°C, 17-21 days, ca. 60% from seed to seedling
biotest / infestation	IV – VII 1	1	1. downey mildew 6 weeks 2. Powdery mildew 6 weeks, max. 1-3% rest-popul.
planting seedlings	1 / 2	1	on own rootstock, resistant proofed at leaves
calculating and describing	3 - 9	1	resistance at leaves/ grapes, agronomical values and quality of wines
selection + multiplication of genotype	3 - 9	8 – 15	grafting and planting in trial fields
calculation of potential of genotype	6 - 12	8 – 15 (ca. 10)	bonitation in field and vinification (3 – 6 times)
multiplication of genotype	ca. 10	ca. 200	ca. 2 places of plantation or other breeders
multiplication of genotype	14 – 17	+ ca. 200	other breeders, 3-8 places, up to 10-20 vinifications
evaluation of genotype in private farms	ab 20. year	ca. 1000	start of evaluation period minimum 5 years for final protection of variety

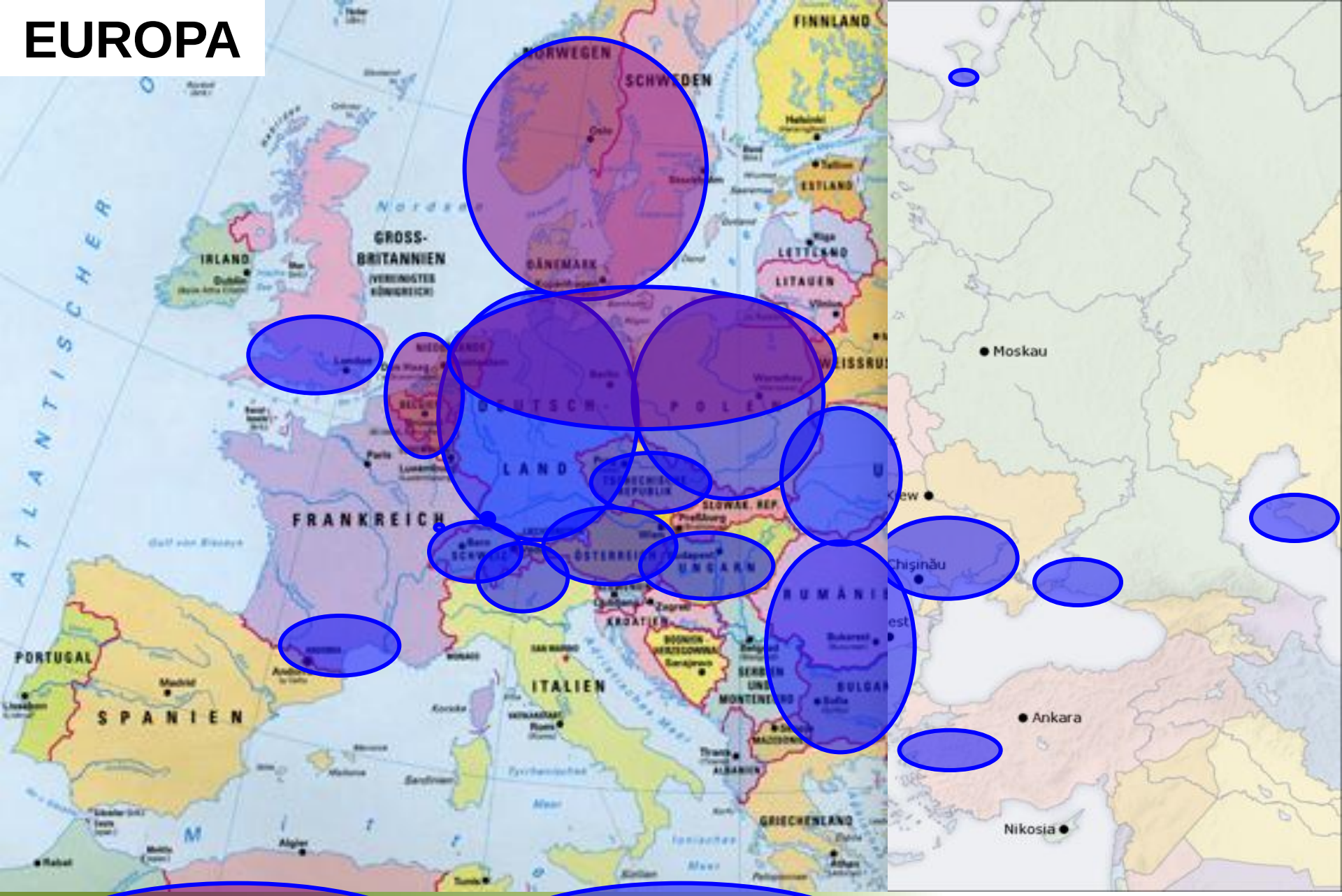
How many seedlings survive?

- 1-3 % survivals as average in testing the resistance,
- From this group in seedling testing (on field) 1-2 % as possible varieties (resistance and viticulture);
- After 15-20 years there are 1-3 plants (= potentially varieties) from 10 000 seeds which could be hopeful for winegrowers after all evaluations.

The Netherlands

- In the beginning the disease tolerance was the biggest issue due to the weather.
- Since 1980 quality and ripeness became the main factor
- The institutes claim that the quality is at least equal to the existing classic varieties.
- On of the biggest problems at the moment is the marketing.
- The Dutch viticulture has almost 1000 acres (80% of the area are new varieties).
- Main reason is the earlier ripening, higher tolerance against diseases and the prohibited spraying

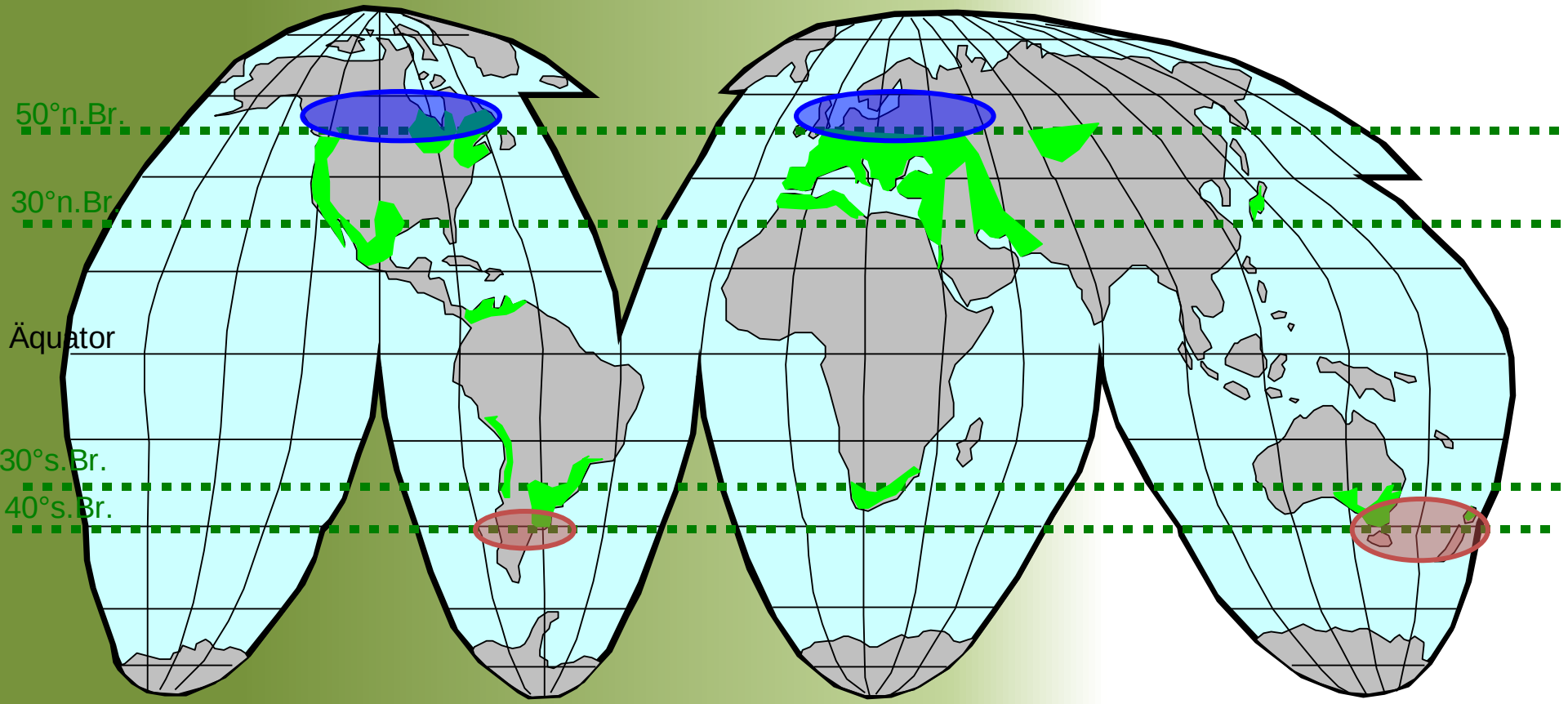
EUROPA



More than 50%

Not more than 5%

Area`s of new varieties



New varieties can be planted:

- Cool cool climate regions
- Cool climate regions
- Classic regions, for biological viticulture
- Regions which have a higher moisture level
- Regions with higher altitudes, which have a chance of earlier frost and colder temperatures in the winter

Development in the last decades.

- Generation I: Mareshal Foch, Leon Millot (1911), Seyval Blanc (1919)
- Generation II: Merzling (1960), Rayon d`ore (1958)
- Generation III: Regent (1967), Johanniter (1968)
- Generation IV: Solaris (1975), Bronner (1975)
- Generation V: Cabernet Cortis (1982), Baron (1983)

Development in the last decades.

- Generation VI: Cabernet Cantor (1989), Cabertin (1991), Pinotin (1990), Muscaris (1987)
- Another new generation is already in development.
- It takes normally 20 years till a new variety is tested and give free for commercial use.

More than 100 different varieties have been developed.

Disease tolerance is better for the environment

BUT the quality of the wine should be at least equal to the classic varieties

Which varieties can be used? Depends on:

- Marketing, which wine type.
- Environmental issues,
  - Yearly rainfall
  - GST, GSS and difference day/night temperature
  - Chance of early frost
- Viticulture issues
  - Which method of pruning
  - Canopy management

Which varieties can be used in our cool climate regions.

- White varieties
  - Solaris
  - Johanniter
  - Muscaris
  - Souvignier Gris
  - Cabernet Blanc
  - Bronner
- Red varieties
  - VB 4
  - Cabernet Cantor
  - Pinotin
  - Monarch
  - Cabertin
  - Cabernet Cortis
  - Prior
  - Cabernet Carbon

Fungus resistant white wine varieties

Souvignier gris (FR 392-83)

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Cabernet Sauvignon X Bronner	
Bud break with burgundy sorts **Flowering: a few days before Pinot Gris.** **Veraison: a few days after Pinot Blanc** **Harvest: with Pinot Blanc**	**High tolerance against powdery mildew** **High tolerance aginst downey mildew** **No henn and chicken** **Bunches: normal, medium compact, long** **Grapes: thick skin, normal**
Quantity 110-140 kg/a 88 - 98° Oe (20/22 brix) 6,5-8,0 g/l TA	
WINE TYPE: 2 styles more Pinot Blanc Style or Pinot Gris style	

Fungus resistant red wine varieties

Monarch (FR 487-88 r)

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(Merzling X (Zarya severa X Muskat Ottonel)) X Dornfelder

Bud break few days before Pinot Noir **Flowering: same as Pinot Noir** **Veraison: a few days before Pinot Noir** **Harvest: a few days before Pinot Noir**	**High tolerance against powdery mildew** **Normal till high tolerance aginst downey mildew** **Bunches: big and open** **Grapes: normal**

145 - 165 kg/ar Sugar around Pinot Noir Botrytis 0%-5%.

Wine type: black fruit, much more colour as PN, high extract and fenol structure

Fungus resistant red wine varieties

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Cabertin (VB 91-26-17)

Die Rebsorte „Cabertin“ wurde 1991 von dem Schweizer Rebenzüchter Valentin Blattner gezüchtet. Sie ist eine Kreuzung aus Cabernet Sauvignon und Resistenzpartnern.

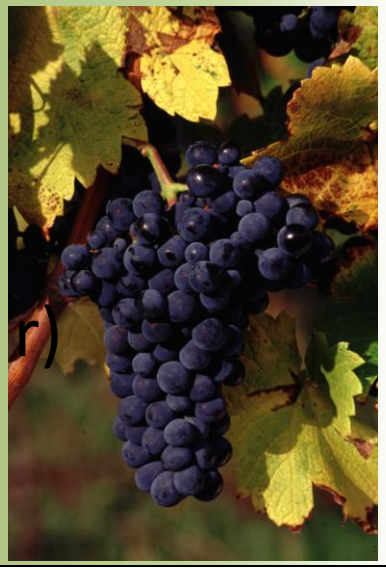
Kreuzung:

Cabernet Sauvignon x Silvaner x (Riesling x Vitis Vinifera) x JS 12417 x S 7053).

Traube:	Die Traube ist schmal, lockerbeerig und wenig geschultert.
Beere:	Die Beere ist rund, klein und von einer gleichmäßigen Wachsschicht überzogen. Die Beerenhaut ist wie bei Cabernet Sauvignon sehr fest und somit sehr widerstandsfähig gegen Botrytis.
Reife:	Der Reifezeitpunkt ist ca. 10-14 Tage vor Cabernet Sauvignon. Anfang bis Mitte Oktober.
Wuchs:	Der Wuchs ist aufrecht und sehr stark. Es bilden sich bis in den Spätsommer neue Geize, was sich auf die Zuckerbildung positiv auswirkt.
Widerstands-fähigkeit:	Gute Resistenz gegen Oidium, Peronospora und Botrytis. Sehr gute Frosthärte bei Winterfrösten.
Geschmack:	Der Wein zeichnet sich durch eine dunkle, rubinrote Farbe aus. Im Duft erinnert der Wein an Waldfrüchte, Brombeeren und Chassis, im Geschmack an einen Syrah oder Cabernet Sauvignon der im Süden gewachsen ist. Durch seine kräftige aber sehr reife Taninstruktur eignet er sich sehr gut für Barriqueweine im internationalen Rotweinstil.
Sortenschutz & Vertrieb:	Rebschule Freytag

Fungus resistant red wine varieties

Cabernet Cortis (FR 437-82 r)



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Cabernet Sauvignon X (Merzling X (Saperavi severnyi X Muskat Ottonel))

Austrieb:	mit Bl. Spätburgunder	**Pero.-Festigkeit:**	sehr gut
Blütezeitpkt.:	kurz vor Bl. Spätburgunder	**Oidium-Festigkeit:**	sehr gut bis gut
Traubenentwkl./ Traubenschluss:	mit Bl. Spätburgunder	**Verrieselung:** / **Stiellähme:**	sehr gering / gering bis mittel
Färben:	ca. 7 Tage vor Bl. Spätbg.	**Traubengröße:**	groß
Erntereife:	ca. eine Woche vor Bl. Spätbg.	**Beerengröße/-dichte:**	mittel / gering

Ertragsniveau: 135 - 150 kg/ar **Mostgewicht:** ca. 10° Oe über Bl. Spätburgunder **Fäulnisanteil:** gering

Weintyp: sehr würzig, intensiver Cabernet-Typ, farbintensiv, sehr extrakt- und phenolreich

Other aspects

- Not all the vines are suitable on every rootstock
- The wines of the vines can be different pro region.
- Combine with classical varieties
- Mostly 1 or 2 times a spraying is needed
- Marketing

Conclusion

- High quality must be the first aim in usage of resistant varieties, only the change of wine against money leads to winegrowers sucess
- With resistant varieties the reduction in pollution of ecosystem is possible. Reduction of sprays to 1 or 2 times a season → bio wine
- Production of grapevines in sensible environment further on is possible → scandinavia, northern canada, southern New Zealand

Conclusion

- A high variability of resistant varieties with very good quality is available (resistance, viticultural and oenological quality)
- Developement in the wine market makes the usage of resistant varieties more easy and leads to economical advantages

Why new clones and which clone should I choose?

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- Viticulture aspects like:
  - Growth in the vineyard, hanging or straight up
  - Bunch structure (compact or open)
  - Grapes (big, small or mixed)
  - Leaf structure (large, medium or small)

- Wine quality
  - Higher or lower yield
  - Aromatic or neutral
  - Amount of sugars, acids,
  - phenol structure
  - Colour of the wine

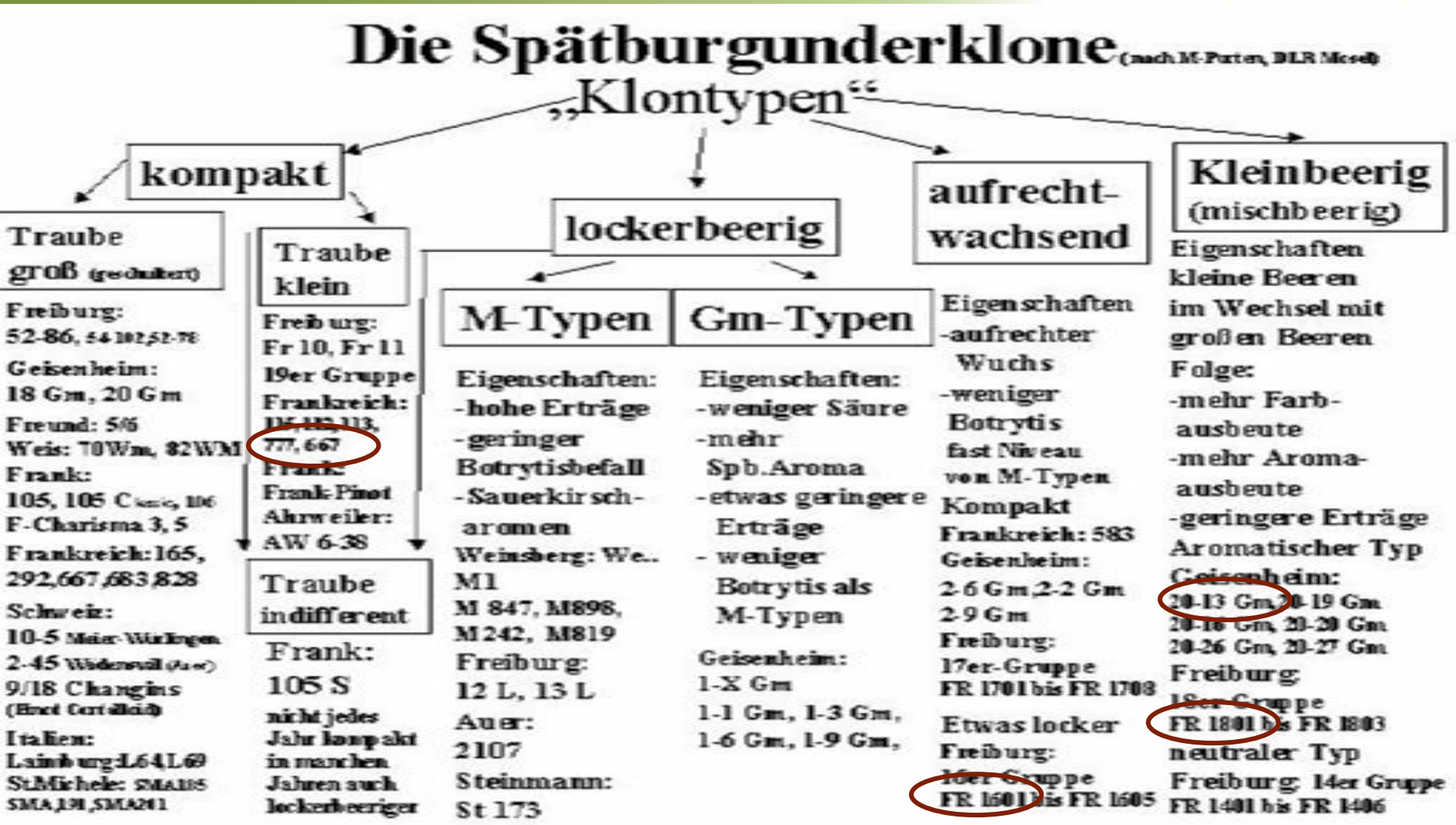
Why new clones and which clone should I choose?

- Region
  - Rainfall → open bunches, otherwise botrytis
  - Frost regions → vines who aren't vulnerable for hen and chicken
  - Soil, rich or poor
  - Rootstock

New clones for cool climate regions

- Pinot Noir
- Chardonnay
- Pinot Gris

New clones of Pinot Noir



New clones of Pinot Noir

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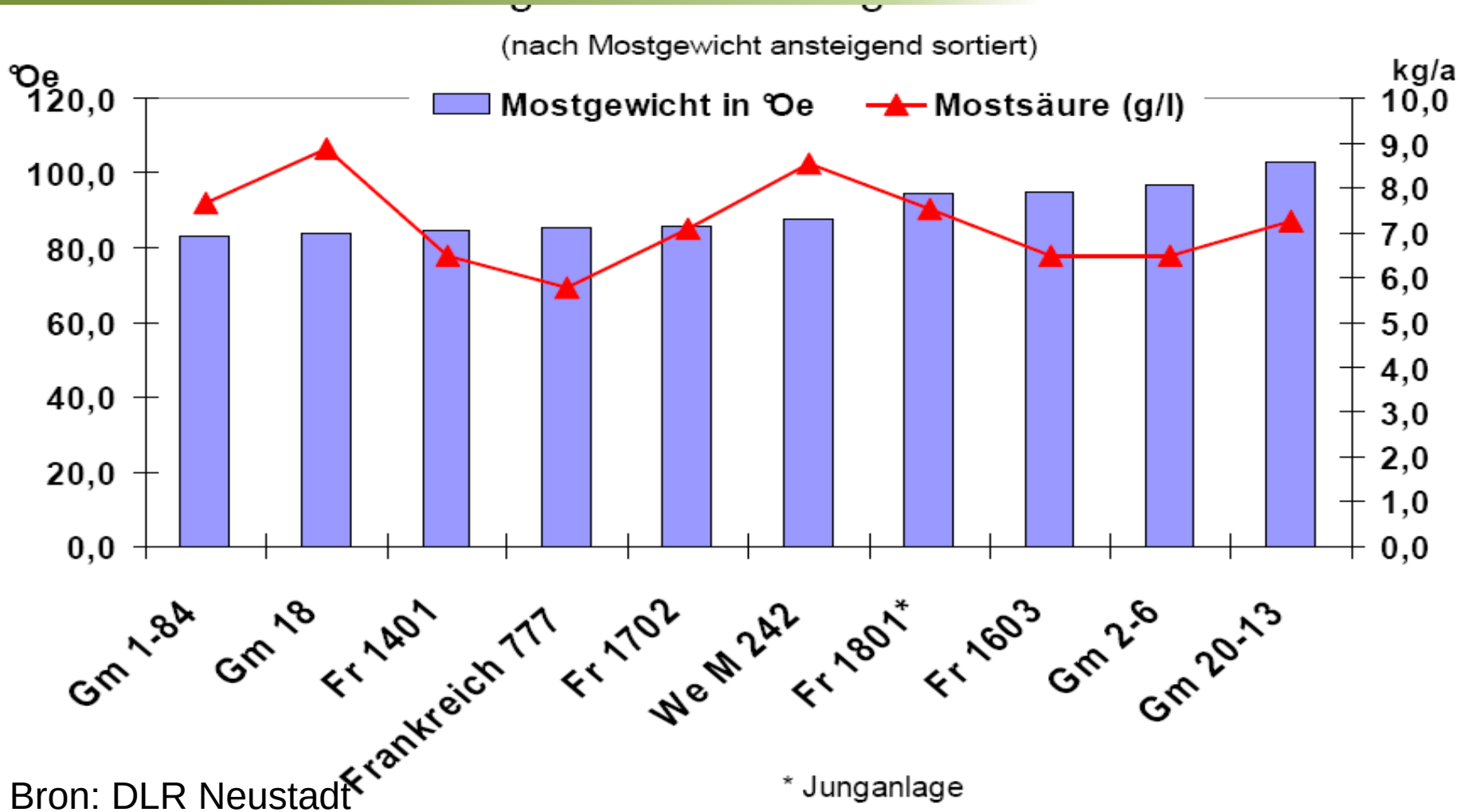
France 777

Gm 20-13

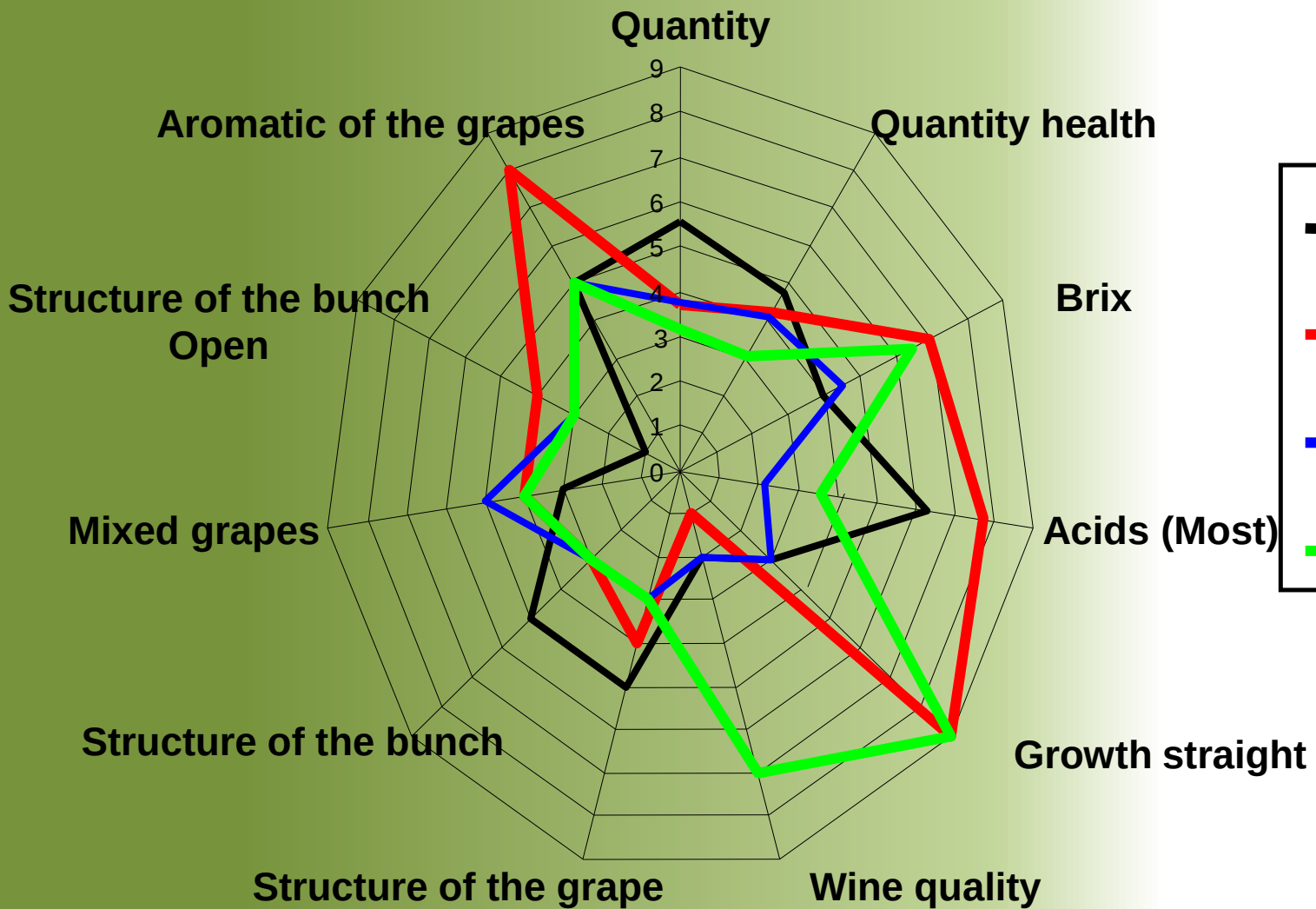
Fr 1601

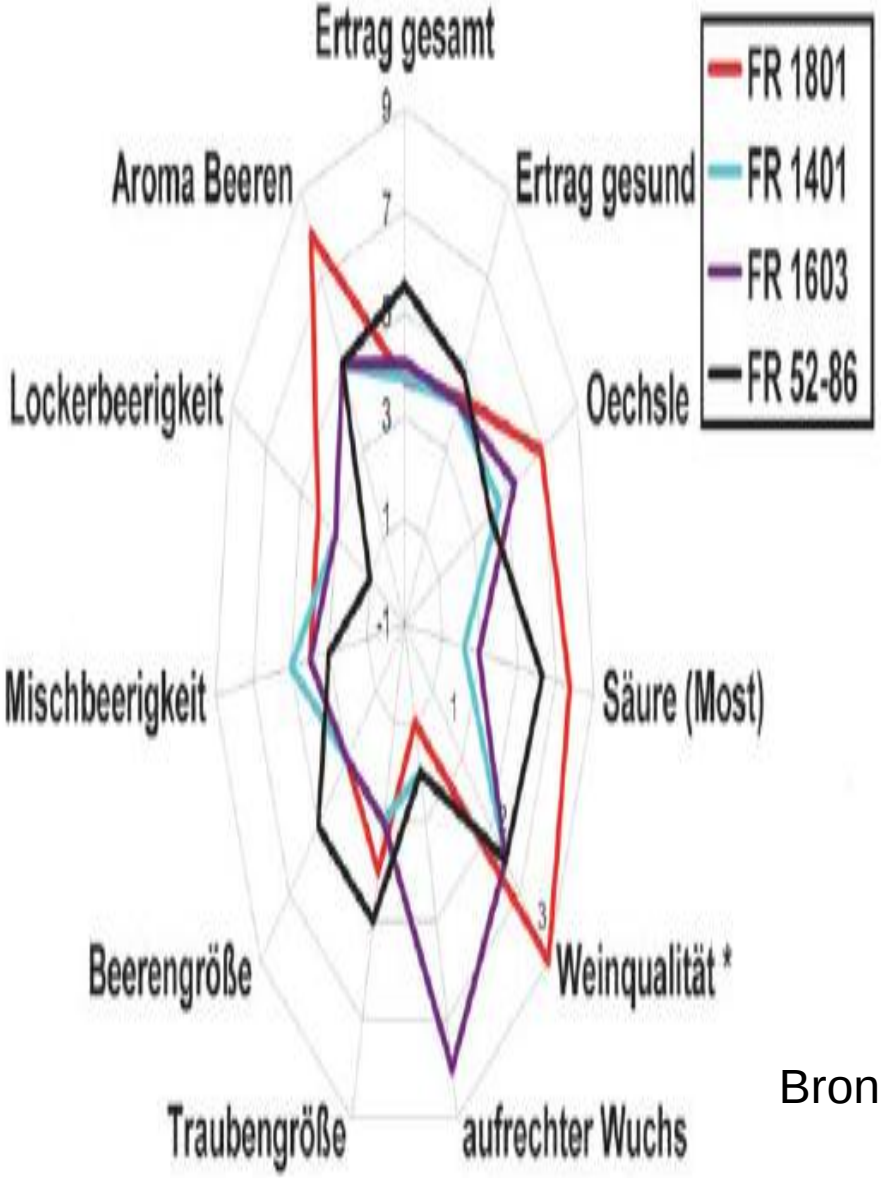
New clones of Pinot Noir

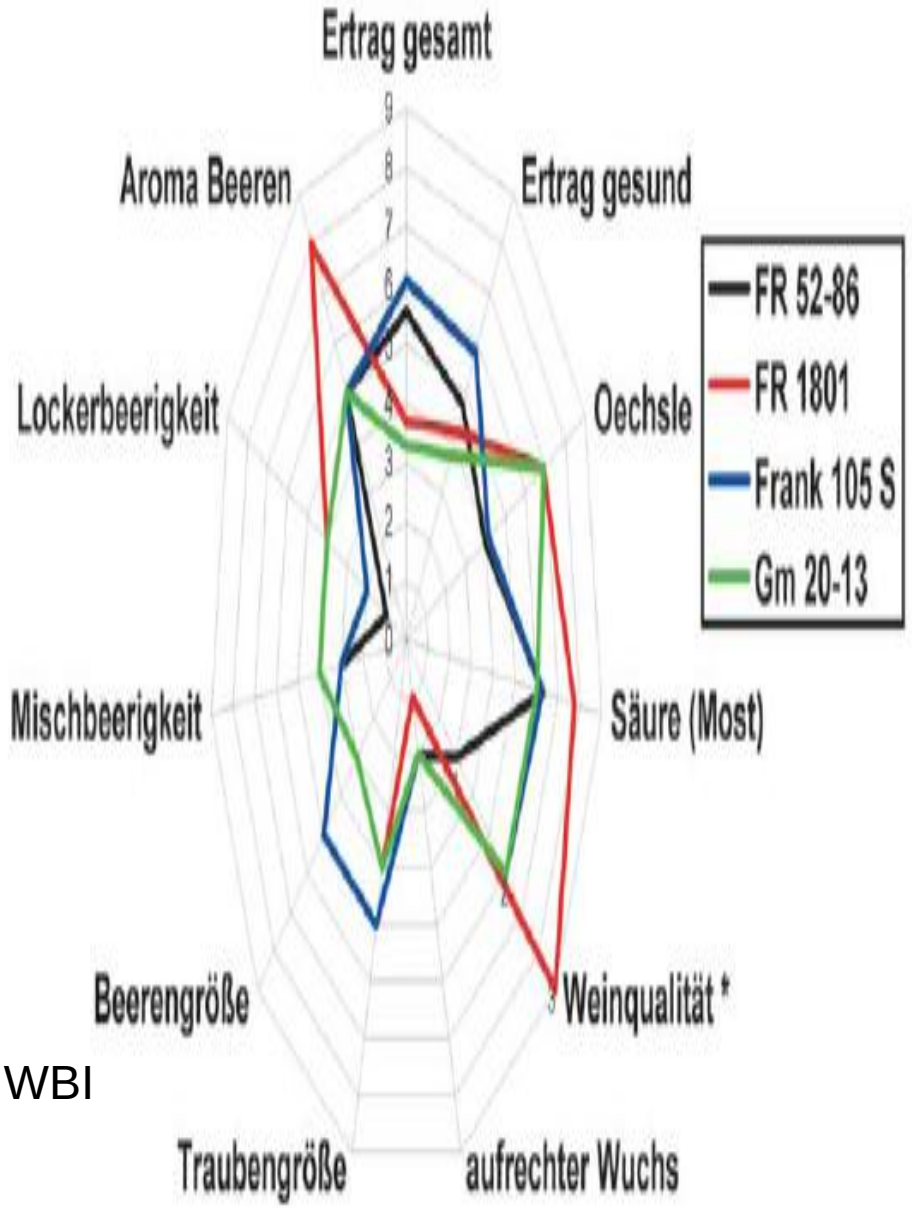


Bron: DLR Neustadt

New clones of Pinot Noir




Ertrag gesamt
Ertrag gesund
Oechsle
Säure (Most)
Weinqualität *
aufrechter Wuchs
Traubengröße
Beerengröße
Mischbeerigkeit
Lockerbeerigkeit
Aroma Beeren
FR 1801
FR 1401
FR 1603
FR 52-86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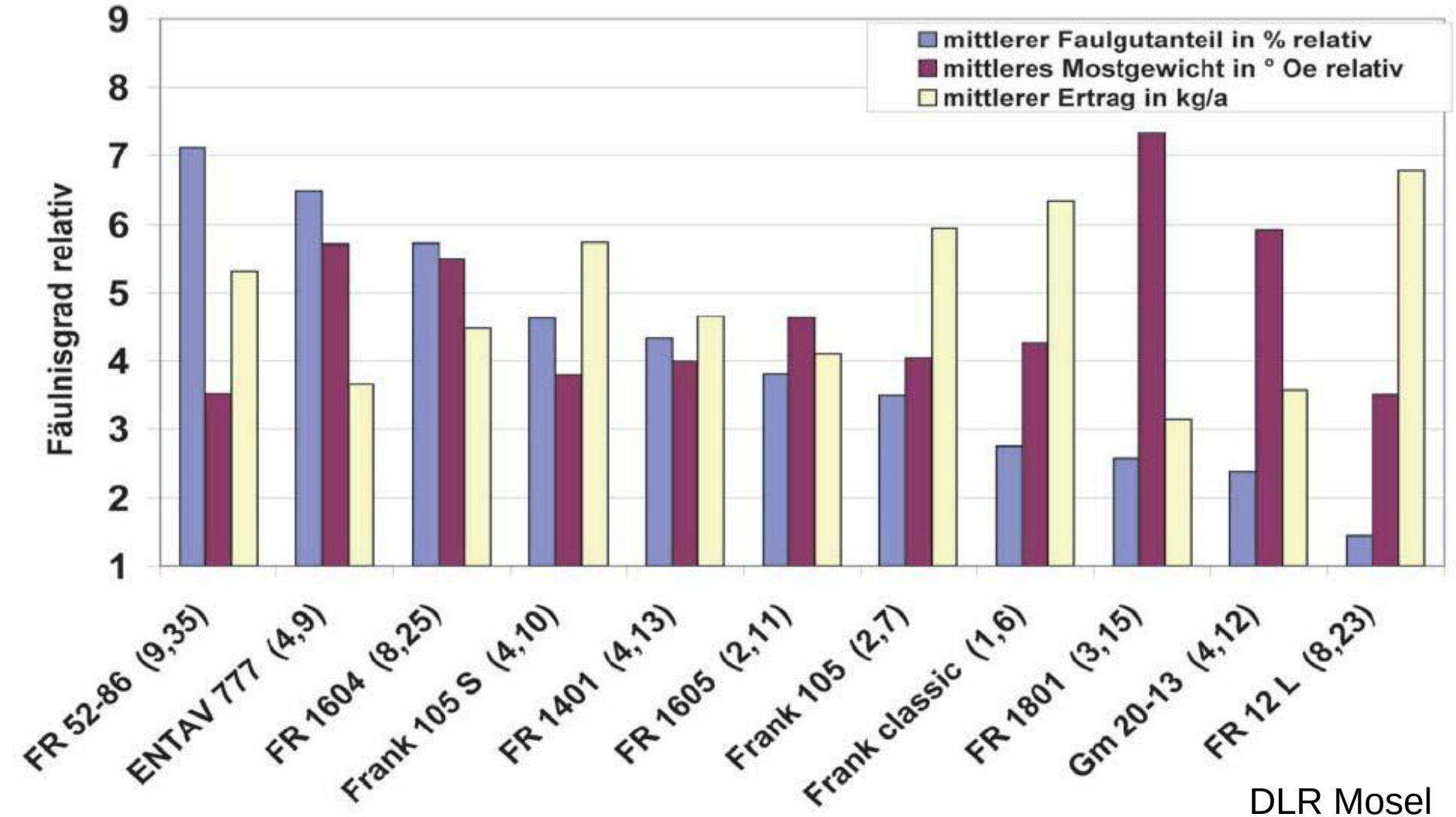
Mischbeerigkeit
Lockerbeerigkeit
Aroma Beeren
FR 52-86
FR 1801
Frank 105 S
Gm 20-13

Bron: WBI

New clones of Pinot Noir



DLR Mosel

New clones of Pinot Noir

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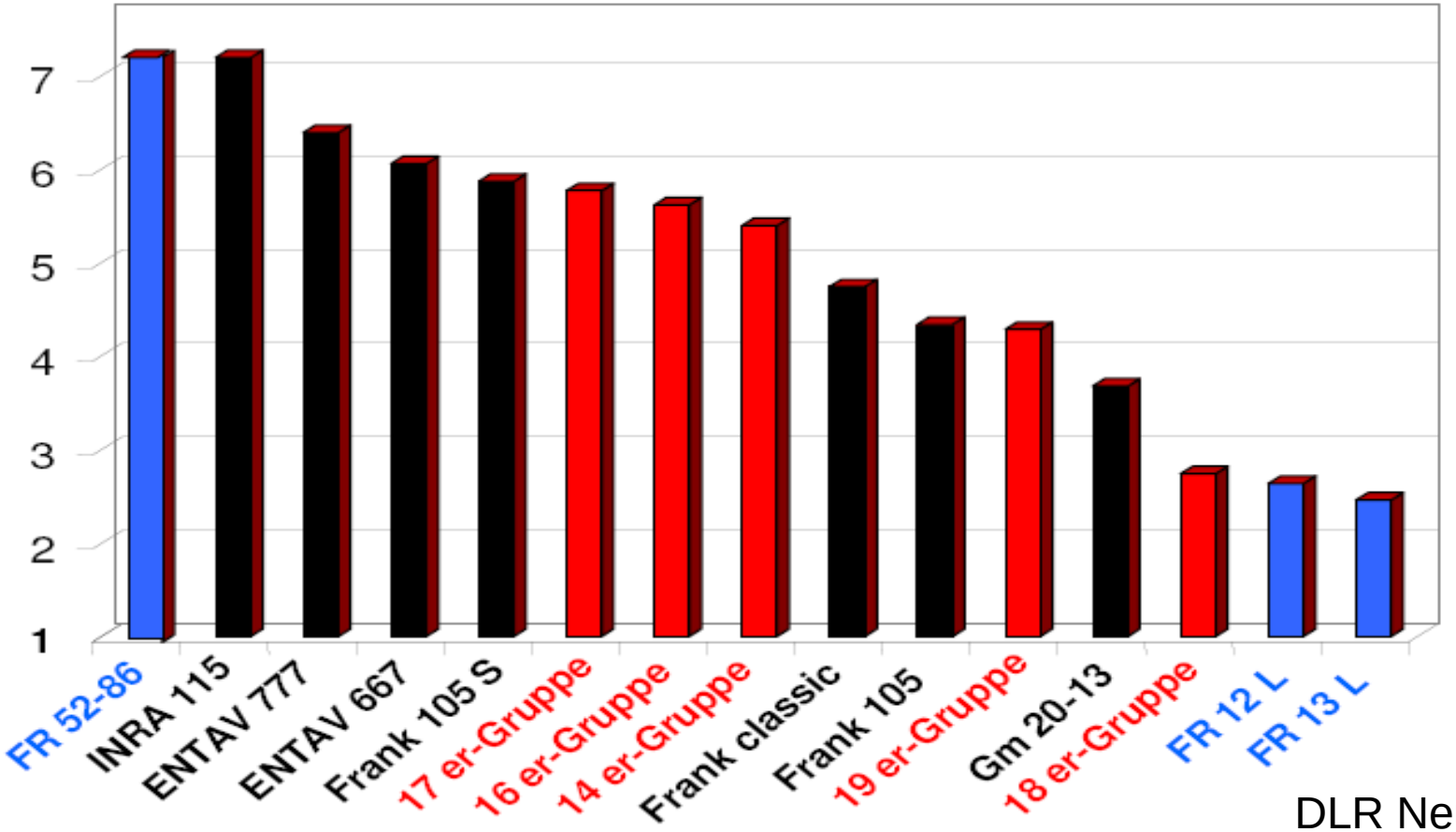
Relativer Botrytisbefall bei verschiedenen Klonen des Blauen Spätburgunder

Untersuchungsjahre 1997-2005, Freiburger Klone 20-40 Ernten, andere Klone 15-25 Ernten,

[Ziffer 1 = sehr gering; Ziffer 9 = sehr stark]



DLR Neustadt

Wine ← Chardonnay → Champagne

Smaller grapes, quantity is less	Mixed bunches	Larger quantity
50 Gm	Fr 150	1 Gm
51 Gm	Fr 151	2 Gm
52 Gm	D 278	3 Gm
53 Gm	D 263	SMA 108
54 Gm	D 264	SMA 123
57 Gm	D 269	SMA 130
D 276 Aroma	D 274	St 130
D 258 Aroma	D 261	Fr 152
Fr 155 intensives Aroma	D 259	D 271
Entav 76	D 253	D 250
Entav 116	Entav 95	D 260
Entav 117	Entav 96	
Entav 118	Entav 277	
Entav 119	Entav 548	

New clones of Chardonnay

FR 155

Clone 96

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New clones of Chardonnay

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Vergleich von 4 Klonen der Rebsorte Chardonnay im Mittel von 6 Jahren (1996 bis 2001)

Bayer. Landesanstalt für Weinbau und Gartenbau, Veitshöchheim, SG Weinbaumanagement

Sorte/Klon	Ertrag kg/ar	°Oechsle	Säure g/l	pH-Wert	Restextr. g/l	DLG Zahl#)
Chardonnay, Burgund 96	108,65 a	93,83 a	9,47 a	3,31 a	11,93 a	2,47
Chardonnay, Burgund 277	101,83 a	95,33 a	10,13 a	3,36 a	11,55 a	2,52
Chardonnay, San Michele 130	102,67 a	92,67 a	10,37 a	3,27 a	11,02 a	2,40
Chardonnay, San Michele 123	92,07 b	95,83 a	9,87 a	3,28 a	11,30 a	2,48
Weißburgunder, Dreher 212	99,53 a	93,83 a	8,92 b	3,37 a	11,57 a	2,47

a,b,c ($p=<0,05$): signifikante Unterschiede zwischen den Klonen bei ungleichen Buchstaben

#) Mittelwert von 5 Ausbaujahren

New clones of Pinot Gris

Compact clones	Mixed clones	Smaller grapes, mixed clones	Open clones
FR 49-207	SMA 505	ENTAV-INRA 457	1-30 Gm
H 1	SMA 514	27 Gm	1-31 Gm
D 42	FR 2001	FR 2007	1-32 Gm
D 43	FR 2002		1-33 Gm
1 Gm	FR 2003		
21 Gm	FR 2004		
63 Wm	FR 2005		
ENTAV-INRA 52	FR 2006		
	FR 2008		

New clones of Pinot Gris

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Punktebewertung 1–5; Bestbewertung 5,0; Weinfehler <1,0 Rangziffernbewertung 1–4; Bestbewertung Rang 1								Wie oft . . .			
Anzahl Prüfer	Klon/ Einzelstock-auslese	Punkte Mittelwert	Rang Summe	Signifikanz*	Rang Mittelwert	Rang Min.	Rang Max.	Rang 1	Rang 2	Rang 3	Rang 4
40	FR 49-207 a	2,37	97	2	2,43	1,00	4,00	11	10	10	9
40	EA 94-46	2,41	99	2	2,48	1,00	4,00	8	13	11	8
40	EA 94-140	2,18	127	1	3,18	1,00	4,00	3	6	12	19
40	EA 94-141	2,53	77	3	1,93	1,00	4,00	18	11	7	4
41	EA 94-142	2,42	122	1	2,98	1,00	4,00	1	12	15	13
41	EA 94-143	2,63	88	2	2,15	1,00	4,00	12	16	8	5
41	FR 49-207 b	2,69	70	3	1,71	1,00	4,00	24	10	2	5
41	SMA 514/18	2,19	130	1	3,17	1,00	4,00	4	3	16	18

Signifikanzstufen 1 bis 3 (3 ist beste, 1 ist schlechteste Weinqualität)

WBI Freiburg

New clones of Pinot Gris

Einzelstock-Auslese WBI Freiburg	Ertrag kg/a	Mostgewicht °Oe	Säure g/l	Befall durch Botrytis und Essig in %
FR 49-207	122,8	94,0	5,4	27,05
EA 94-46	124,8	93,0	5,9	33,98
EA 94-140	106,1	97,0	5,6	14,88
EA 94-141	92,4	97,0	5,4	10,44
EA 94-142	109,8	95,0	6,0	10,12
EA 94-143	120,9	95,0	6,0	15,97
SMA 514/18	101,8	94,0	5,9	9,99

New clones of Pinot Gris

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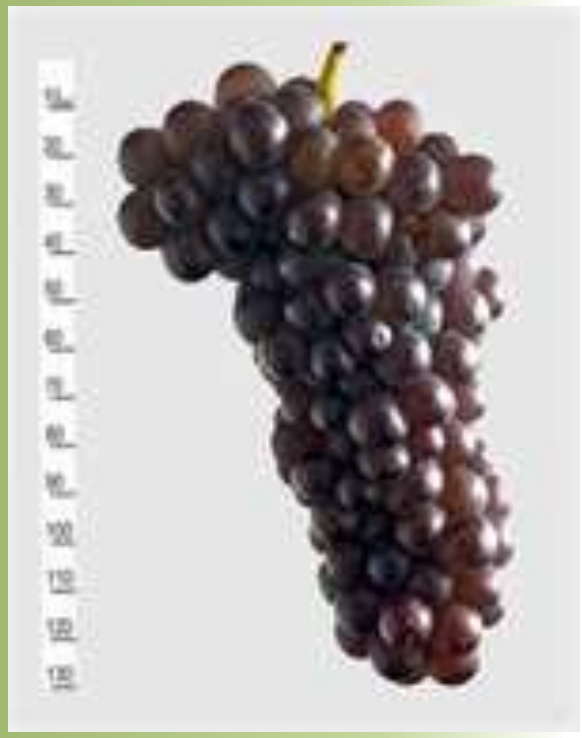

Acknowledgement

St. Martinus, Hans Beurskens
Wageningen University, Prof. Tramper.
Wine Institute Freiburg, Dr. Jorger
DLR Neustadt,
Weinsberg LWG
Valetin Blatner.

Ir. Stan Beurskens (Msc)
E-mail: info@wijnbouwadvies.nl
Tel: 0031-613101431
Facebook, linkedIn and Skype: stanbeurskens