Clonal selection of rootstocks by means of determination of hard bast layers

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Summary: Determination of the number of closed circles of hard bast plates on matured shoot cuttings, which is used for wood maturity control, was applied as selection method to four rootstocks: *Vitis berlandieri x V. riparia* Kober 5 BB, Teleki 5 C, Craciunel 2 and V. *riparia x V. rupestris* Schwarzmann. For each selected vine stock the linear regression of wood maturity was calculated, considering the distance from the base of the cane. From the linear regression equation the average length of the matured wood part was calculated for each stock.

The results of 3-year investigations show that the degree of rootstock wood maturity is not only dependent on the meteorological conditions of the years but is also genetically conditioned.

Key words: rootstock, clone, selection, wood, maturity, lignification, hard bast, sclerenchyma, phloem.

Introduction

The relation between the larger number of hard bast circle layers on rootstock cuttings and vine nursery yields of first-class grafted vines has been generally known for a long time (e. g. KRAUS 1979; KISIL 1986). We have oriented our efforts to determine if the above mentioned relationship may be applicable for clonal selection in populations of rootstock varieties.

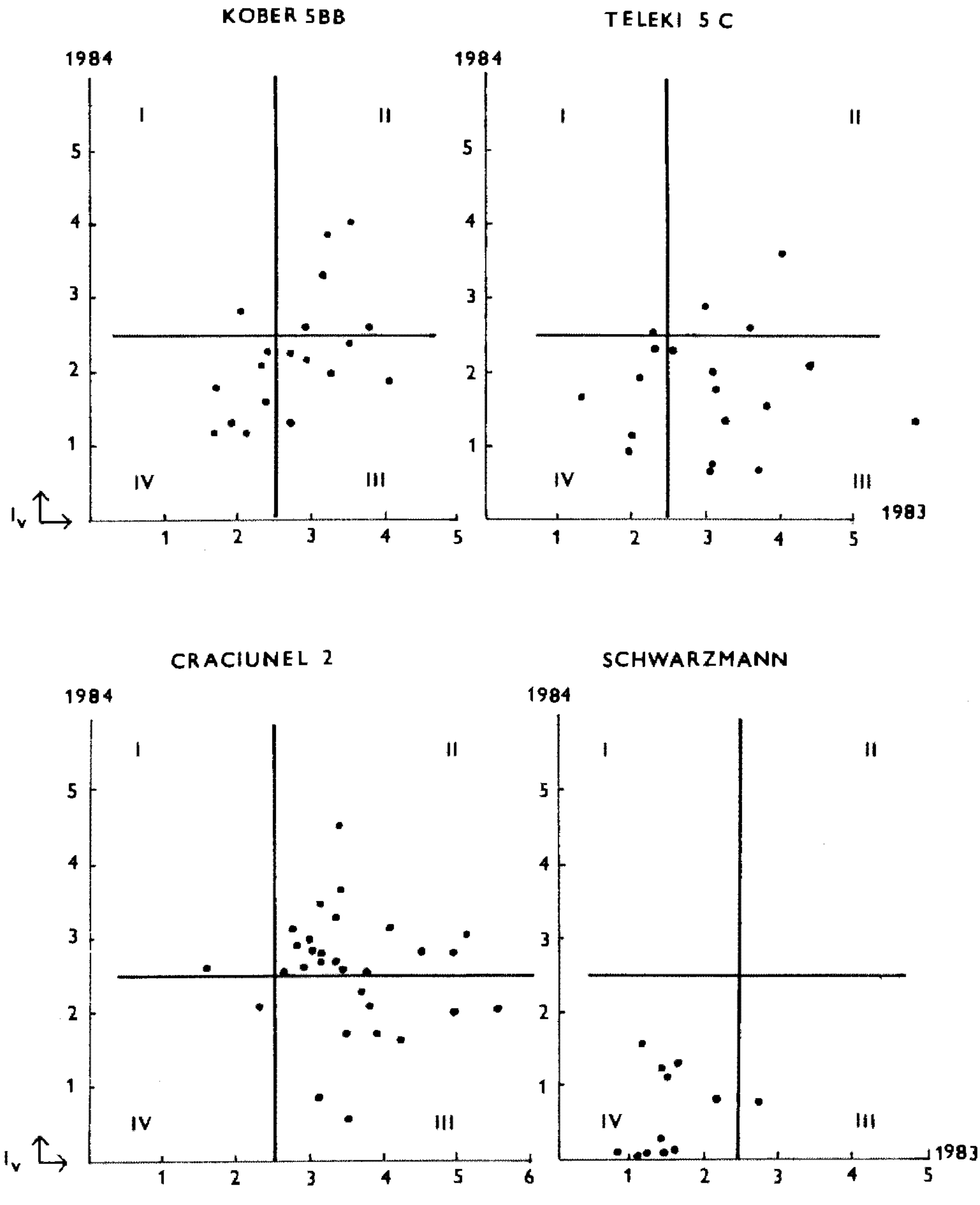
Material and method

During a 3-year experiment, observations of closed hard bast circles of vine stocks selected according to different criteria (wood : pith tissue ratio, length of matured cane, number of cuttings, etc.) were recorded on four rootstocks – *Vitis berlandieri x V. riparia* Kober 5 BB, Teleki 5 C, Craciunel 2 and *V. riparia x V. rupestris* Schwarzmann – in one locality. The hard bast layers were counted behind each sympodium of all canes on separate vine stocks. Observations were recorded on the hollow as well as on the dorsal side of cane. The number of circles of both sides – 3/1, 3/2, 2/0, etc. – were reciprocally multiplied (3, 6, 0) and these data characterizing the maturity stage 'p' in the corresponding cane cross section were then statistically evaluated. For each selected vine stock the linear regression of the maturity stage 'p' was calculated in relation to the distance from the base of cane (PALENIK 1984).

The values obtained for the single rootstocks in the years 1983 and 1984 are shown in the figure. Similarly, in the table the selected vine stocks are included in maturation groups, considering the entire cane length, for each possible 2-year comparison, i. e. 1984-1983, 1985-1983, 1985-1984.

Results and discussion

Already the first look at the graphical illustration (Fig.) indicates the applicability of this method for rootstock selection. The fact that rootstocks Kober 5 BB and T 5 C are clonal populations while Craciunel 2 is a previously selected clone, is reflected by the larger diversion of Kober 5 BB and Teleki 5 C vine stocks, while in Craciunel 2 the majority of vine stocks was placed in quadrant II (the highest wood maturity). Only one vine stock of the variety Craciunel 2 is placed in quadrant IV (very weakly matured wood). For the example of rootstock Schwarzmann, the stated method also appeared to be positive. From the diagram it is apparent that the experimental location with heavy soils is not suitable for this rootstock, which is generally known and confirmed by applying this method. The majority of vines of this rootstock are placed in quadrant IV (the most weakly matured wood). Only one vine stock in each year showed conclusively above-average values of wood maturation.



Lignification of single vines, l_v (m).

Also, the data in the table confirm these statements for the 3-year period of the selection process. The percentage of vine stock diversion in the individual quadrants points to the fact that in

Lignification of rootstocks. Frequency of single vines in the quadrants of two-dimensional variance analysis

Cultivar	Compared years	Frequency in quadrants				Number of vines	
		I	II	III	IV	3x the best lignific. above 2.5 m	3x the worst lignific. under 1.5 m
Kober 5BB	1984–1983	5/43	4/38, 5/12, 5/32, 6/9, 8/36	4/18, 4/36, 5/5, 5/31, 5/23, 6/22	4/8, 4/60, 6/2, 6/39, 8/22, 8/34, 8/55		
	1985–1983	4/60, 6/2	5/12, 6/22	4/18, 4/36, 4/38, 5/5, 5/31, 5/23, 5/32, 6/9, 6/39, 8/36	4/8, 5/43, 8/22, 8/34, 8/55	1	4
	1985–1984	4/60, 6/2, 6/22	5/12	4/36, 5/32, 5/36, 5/43, 6/9	4/8, 4/18, 4/36, 5/5, 5/23, 5/31, 6/39, 8/22, 8/34, 8/55		
% of vines		10,53	14,03	36,84	38,60	1,67	6,67
Teleki 5C	1984–1983	-	4/10, 5/39, 10/50	4/33, 4/42, 4/59, 5/34, 6/5, 6/65, 6/69, 6/74, 7/61, 8/63	4/14, 6/49, 6/64, 8/18, 8/34, 8/58		
	1985–1983	4/14	4/33, 4/42	4/10, 4/59, 5/34, 5/39, 6/5, 6/65, 6/69, 6/74, 7/61, 8/63, 10/50	6/49, 6/64, 8/18, 8/34	0	4
	1985–1984	4/33, 4/42	-	4/10, 4/14, 5/39, 10/50	4/59, 5/34, 6/5, 6/49, 6/64, 6/65, 6/69, 6/74, 7/61, 8/18, 8/34, 8/63		
% of vines		5,45	9,09	45,45	40,0	0	7,27

case of the rootstock Craciunel 2 the quadrant IV is very rarely frequented in comparison with the other ones.

Cultivar	Compared years	Frequency in quadrants				Number of vines	
		I	II	III	IV	3x the best lignific. above 2,5 m	3x the worst lignific. under 1,5 m
Craciunel 2	1984–1983	6/8	4/40, 4/52, 5/4, 5/8, 6/30, 6/69, 7/6, 7/13, 7/18, 7/27, 7/33, 7/39, 7/67, 9/58, 9/70, 10/3, 10/12, 10/61	5/70, 6/68, 7/34, 7/69, 10/13, 10/28, 10/46, 10/70, 11/7	4/49		
	1985–1983	-	17/13, 10/12, 10/46	4/27, 4/40, 4/52, 5/4, 5/8, 5/70, 6/30, 6/68, 7/6, 7/18, 7/27, 7/33, 7/34, 7/39, 7/67, 7/68, 9/70, 10/13, 10/28, 10/61, 10/70, 11/7	4/49, 6/8	2	1
	1985–1984	10/46	7/13, 10/12	4/40, 5/4, 5/8, 6/8, 6/30, 6/69, 7/6, 7/18, 7/27, 7/33, 7/39, 7/67, 9/70, 10/13, 10/61	4/49, 5/70, 6/68, 7/34, 7/68, 10/13, 10/28, 10/70, 11/7		
% of vines		4,71	27,05	54,12	14,12	2,35	1,17
Schwarzmann	1984–1983	-	6/24	4/24	4/8, 7/5, 7/19, 7/22, 7/23, 8/11, 8/12, 9/24, 9/30, 15/5, 15/31		
	1985–1983	-	6/24	-	4/8, 4/24, 7/5, 7/19, 7/23, 8/11, 8/12, 9/24, 9/30, 15/5, 15/31	1	8
	1985–1984	-	6/24	-	4/8, 4/24, 7/19, 8/11, 8/12, 9/24, 9/30, 15/5, 15/31		
% of vines		-	8,57	2,86	88,57	8,57	22,86

Another proof of the applicability of the examined method in clonal selection is the fact that the same vine stocks of two extreme groups (the best and the worst wood maturation) are represented in each of the experimental years. Some of the vine stocks oscillate between neighbouring quadrants. This means that wood maturation is conditioned not only by season but also genetically. Obviously, all clonal selection including that of *V. vinifera* varieties is based on this principle. But the most frequently used selection methods for determination of rootstock wood maturation consist of subjective evaluations which sometimes lead to controversial results.

In accordance with these facts, this objective method, which determines not only wood maturity in successive years but also the genetic disposition of individual vine stocks with regard to wood maturation, contributes to successful selection work. Such an objective selection method, which considers the most important selection criterion of rootstocks – wood maturation – and which can be applied already in the first selections, saves the breeder a great portion of labourious work.

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The influence of clonal variation, pruning severity and cane structure on yield components of three Cabernet Sauvignon clones

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Abstract: Yield components responsible for yield variation within and among three Cabernet Sauvignon clones free of all known viruses were determined over a 2-year period at Davis and over a 3-year period at Oakville, California. Average yield per vine in kg ranged from 7.3 for the lowest yielding clone to 15.8 for the highest yielding clone. Pruning severity, expressed as canes retained/weight of prunings, and yield per cane contributed 26 % and 72 % of the yield per vine variation respectively. Vine size, indicated by the weight of prunings, was unrelated to yield per vine. Important components of yield per cane were the portion of nodes at which shoots developed, the number of clusters per node position, and fruit-set. Yield per shoot was determined mainly by cluster number and fruit-set, which contributed 32 % and 62 % of the variation respectively. A difference in yield per vine of the two highest yielding clones resulted from a difference in the amount of fruit produced on spur shoots or shoots arising from latent buds. Yield per shoot of these two clones was equal but the highest-yielding clone bore fewer and larger clusters. The lowest-yielding clone exhibited poor fruit set which resulted from inadequate or inviable pollen. In one year, thicker canes were more productive due to better bud burst and fruit set.