INFLUENCE OF ROOTSTOCKS ON MUST COMPOSITION, IN PARTICULAR PH AND ACIDITY

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Abstract

In order to verify the influence of different rootstocks on must composition, some trials were carried out on 'Moscato bianco', 'Barbera' and 'Pinot Gris'. In the same family of rootstocks, induction of vigour and must composition may differ widely. Among *berlandieri* x *rupestris* rootstocks, '420 A', less vigorous, is characterized by a rather low pH in spite of poor total acidity.

1. INTRODUCTION

In previous trials on rootstock choice, differences concerning must total acidity and pH were observed. In some cultivars, 'Kober 5BB' induced high yield with good sugar content but strong acidity. On the contrary '420 A' induced lower acidity but lower pH than 'Kober 5 BB'. In order to closely examine the influence of rootstocks on must acidity further studies were carried out.

2. MATERIAL AND METHODS

The trial was carried out on 6 vineyards and 3 cultivars (2 sites each); planting density varied between 3500 and 5000 plants/ha; vines were trained to vertical trellis and pruned according to modified Guyot. All the vineyards were located on hill slopes. The soils varied from sandy clay-loam or silty loam to clay, with 8.4 to 30% of active lime and 51-105 ppm of exchangeable K_2O.

'Barbera' was grafted on 'du Lot', '3309', '140 Ru', '1103 P', 'Kober 5 BB', and '125 AA'; 'Pinot gris' on 'du Lot', '1103 P', '420 A', 'Kober 5 BB', '125 AA', 'S.O.4', 'Cosmo 2', and '5 C'; 'Moscato bianco' on 'du Lot', '140 Ru', '1103 P', '420 A', 'Kober 5 BB', 'S.O.4', 'Cosmo 2', 'Cosmo 10', '157.11', '225 Ru', and '41 B'. For all the cultivars 'Kober 5 BB' was chosen as control due to its expansion between 1960 and 1980 and its diffusion in Piedmont.

The considered parameters were: pruning wood (vigour); cluster weight and number (yield); must total soluble solids, pH, total acidity (from 1984 or 1987 to 1991), tartaric acid, malic acid, K, Mg and Ca content; leaf fresh and dry weight, N, P, K, Ca, and Mg (2 years).

Data analysis was performed by ANOVA (within each cultivar); Dunnett's test (using 'Kober 5BB' as control) and test for sphericity if $\chi 2$ $P<0.001$, then Wilks' Lambda test.

3. RESULTS

Among the factors susceptible of affecting acidity and pH, the effect of environment (sites and years) was significant for the 3 cultivars. The rootstock had always a significant effect on total acidity (as on soluble solid content) and, for 'Moscato bianco' and 'Pinot gris', on pH (table 1). The same was true for year x site interaction. The interaction rootstock x site was significant as must acidity regards for 'Moscato bianco' and 'Pinot gris'.

In 'Barbera' (table 1a) the vines on 'Kober 5BB' gave must with high sugar content despite high yield and juice total acidity, with low pH. Vines on '3309 C' were the worst producers, obviously not very vigourous, have clusters significantly lighter than on 'Kober 5BB', and gave must with the highest sugar content and the lowest acidity. 'Du Lot' and '125 AA' induced less acidic must, the first in particular lower malic acid, but not higher sugar than those on 'Kober 5BB' despite lower yield. The leaf petioles of vines grafted on these rootstocks and on '3309' were richer in K (3.70, 4.06, and 3.07 versus 2.08%) than those on 'Kober 5BB', despite their lower vigor (table 2a). Vines grafted on '140 Ru', rootstock inducing high vigour and crop, had must with lower sugar than on 'Kober 5BB' and the same high acidity. In 'Barbera' vigour and must pH were positively correlated in '3309 C' and 'du Lot', less vigorous rootstocks, not on more vigourous '140 Ru', but not even on '125 AA', similar to 'du Lot' and '3309 C' regarding the vigour induced in 'Barbera'.

For 'Moscato bianco' (table 1b) vines grafted on '420 A' had vigour, cluster weight, must total acidity and pH lower than those on 'Kober 5BB'. '225 Ru' induced lower vigor than 'Kober 5BB', the highest sugar

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Table 1 – Growth, yield and must main parameters: means and significance of comparison with 'Kober 5 BB'.

Table 1a – 'Barbera'.

Rootstocks	*Pruning wood g/plant*	*Yield kg/plant*	*Cluster number*	*Cluster weight (g)*	*°Brix*	*Total acidity meq/l*	*pH*
du Lot	627*	2.80*	14.5	187*	19.6	152*	3.03
3309	537*	2.62*	16.4	161*	21.1*	138*	3.05
140 Ru	1036	3.97	17.6	222	19.4*	187	2.99
1103 P	1028	3.89	17.5	222	19.8	188	3.01
5BB	976	3.93	16.6	233	20.0	189	2.98
125 AA	705*	3.79	17.7	216	19.5	64*	3.02
rootst. F	***	***	*	***	***	***	NS

Table 1b – 'Moscato bianco' (White Muscat').

Rootstocks	*Pruning wood g/plant*	*Yield kg/plant*	*Cluster number*	*Cluster weight (g)*	*°Brix*	*Total acidity meq/l*	*pH*
du Lot	839	2.98	15.5	192*	18.0	129	3.06*
140 Ru	814	3.25	16.5	197	17.8	129	3.05*
1103 P	878	3.24	16.4	198	17.8	133	3.06*
420 A	621*	3.01	15.2	198	18.1	117*	3.07*
5BB	827	3.34	16.0	209	17.9	129	3.10
S.O.4	855	3.71	19.1*	194*	18.2	133	3.07*
C 2	896	3.08	15.8	195	17.7	134*	3.05*
C 10	970*	3.13	16.0	195*	17.9	134*	3.08*
157.11	801	3.00	15.4	195	18.3	135*	3.06*
225 Ru	625*	3.30	15.0	225*	18.6*	115*	3.15*
41 B	804	3.25	17.1	190*	17.8	133	3.03*
rootst. F	***	***	***	***	**	***	***

Table 1c – 'Pinot Gris'.

Rootstocks	*Pruning wood g/plant*	*Yield kg/plant*	*Cluster number*	*Cluster weight (g)*	*°Brix*	*Total acidity meq/l*	*pH*
du Lot	516*	3.04*	23.5*	125	17.9*	122*	3.01*
1103 P	656	2.56	20.7	123	22.1	87*	3.06
420 A	537*	2.72*	20.9	127	22.4	96	3.03
5BB	775	2.04	17.3	112	22.8	98	3.06
S.O.4	630*	2.49	19.4	123	21.0	109*	3.05
C 2	804	2.96*	20.5	142*	22.1	95	3.05
5 C	572*	2.94*	21.4	126	18.5*	127*	3.05
125 AA	663	3.15*	22.2	139*	18.3*	129*	3.06
rootst. F	***	***	*	**	**	***	*

Table 2 – Leaf blade weight (g) and main mineral content (% d.w.).

Table 2a – 'Barbera'.

Rootstocks	*Fresh weight*	*Dry weight*	*Blade*				*Petiole*
			N	*P*	*Ca*	*Mg*	*K*
du Lot	4.35	1.48*	1.62	0.13	1.71*	0.22*	3.70*
3309	3.48	1.15	1.90	0.13	2.07*	0.25	3.07*
140 Ru	4.18	1.26	1.65	0.16	2.13*	0.33	2.33
1103 P	3.69	1.13	1.64	0.15	2.34	0.42*	1.70
5 BB	3.95	1.21	1.75	0.13	2.48	0.31	2.08
125 AA	3.73	1.16	1.92*	0.13	2.49	0.19*	4.06*
rootst. F	***	***	***	NS	***	***	***
r. x site F	NS	*	***	NS	NS	NS	NS

Table 2b – 'Moscato bianco' ('White Muscat').

Rootstocks	*Fresh weight*	*Dry weight*	*Blade*				*Petiole*
			N	*P*	*Ca*	*Mg*	*K*
du Lot	4.30	1.35	2.17*	0.16	2.74	0.57*	0.31*
140 Ru	3.79	1.19	2.03	0.17*	2.66	0.58*	0.42*
1103 P	4.05	1.29	1.94	0.18*	2.65	0.57*	0.28*
420 A	3.86	1.26	1.86	0.14	2.41	0.39	0.48*
5 BB	4.16	1.34	1.96	0.14	2.62	0.44	1.25
S.O.4	4.65*	1.46	1.97	0.15	2.59	0.47	0.33*
C 2	4.36	1.35	2.03	0.18*	2.48	0.46	0.49*
C 10	4.39	1.41	2.08	0.16	2.88	0.45	0.48*
157.11	4.34	1.33	1.97	0.15	2.48	0.45	0.32*
225 Ru	4.27*	1.39	1.69*	0.11*	2.10*	0.38	2.43*
41 B	3.96	1.19	1.95	0.16	2.53	0.56*	0.31*
rootst. F	***	**	***	***	***	***	***
r. x site F	NS	NS	NS	NS	NS	*	***

Table 2c – 'Pinot Gris'.

Rootstocks	*Fresh weight*	*Dry weight*	*Blade*				*Petiole*
			N	*P*	*Ca*	*Mg*	*K*
du Lot	2.62*	0.87*	1.67*	0.22*	2.53	0.32	3.17*
1103 P	2.99	1.04	1.51*	0.12	2.74*	0.59*	0.65
420 A	2.90	1.02	1.41	0.14	2.69*	0.49	1.24*
5 BB	3.15	1.10	1.28	0.12	2.33	0.41	0.81
S.O.4	3.01	1.04	1.52*	0.12	2.90*	0.35	1.66*
C 2	3.18	1.09	1.37	0.11	3.01*	0.50	0.73
5 C	3.02	1.01	1.74*	0.15	2.86*	0.28*	2.92*
125 AA	2.91	0.97	1.70*	0.15	2.94*	0.32	3.14*
rootst. F	*	*	***	***	***	***	***
r. x site F	NS	NS	NS	NS	NS	NS	**

content, the lowest total acidity and the highest pH, together with the highest K petiole concentration (table 2b). The vines on all the other rootstocks had significantly lower petiole K content and lower must pH than 'Kober 5BB', also when the total acidity was the same (on 'du Lot', '140 Ru', '1103 P', and 'S.O.4') or higher (on 'Cosmo2', 'Cosmo10', and '157.11').

In 'Pinot Gris' (table 1c) the lowest acidity was noticed on '1103 P' that induced also a good sugar content; 'du Lot', '125 AA', and '5C' induced yield higher than 'Kober 5BB', with lower vigor, lower must sugar content and higher acidity than 'Kober 5BB'. For 'Pinot Gris', the '125 AA' and 'du Lot' rootstocks confirmed their aptitude to increase petiole K content observed for 'Barbera' (tables 2a and 2c). The last rootstock did not confirme this pattern for 'Moscato bianco'.

4. CONCLUSIONS

In the same family of rootstocks, scion induced vigour and must composition may differ widely. Among *berlandieri* x *riparia* rootstocks, '420 A' is characterized by the induction of a rather low pH in spite of a poor total acidity: the petiole K concentration is generally low, without significant variation in K must content. In many cases positive relationships of plant vigour with malic acid content in the berries and in some cases with must K content were observed, but not always confirmed. The relationship between vigour and different components of acidity and between vigour and cationic content, as all biological phenomena, may be expressed by a mathematical equation only with a wide approximation or in specific conditions. A relationship may be valid in case of a wide range of vigour or of bud charge per plant, whereas it may not fit in case of plants of low vigour and yield per plant. Apart from environmental and cultural effect, the sugar accumulation and the organic acid degradation in the berry are not always directly related. The choice of rootstock may modify more the first or more the second phenomenon, interacting positively or negatively with *Vitis vinifera* cultivar.

INFLUENZA DEL PORTINNESTO SULLA COMPOSIZIONE DEL MOSTO CON PARTICOLARE RIFERIMENTO A PH ED ACIDITÀ

Riassunto

La ricerca è stata effettuata su 'Moscato bianco', 'Barbera' e 'Pinot grigio' per chiarire l'influenza di differenti portinnesti sulla composizione del mosto. Il vigore e la composizione del mosto indotta da portinnesti della stessa famiglia può variare grandemente. Tra i berlandieri *x* riparia *il '420 A' (poco vigoroso) induce pH bassi accompagnati da limitata acidità totale: il contenuto fogliare di K (piccioli) è generalmente scarso, mentre le variazioni nel mosto non sono significative. In vari casi vi è correlazione fra vigore della pianta e contenuto di K o acido malico del mosto, ma non sempre. Non si possono quindi semplificare le modificazioni nel metabolismo del mosto ad effetti indiretti, legati al vigore vegetativo, perchè il portinnesto, interagendo col vitigno da frutto, può non indurre sempre le stesse variazioni nella composizione del mosto interferendo con più di uno dei processi che si verificano durante la maturazione del frutto.*

EFFET DU PORTE-GREFFE SUR LA COMPOSITION DU MOÛT ET SPECIALMENT SUR SON PH ET SON ACIDITÉ

Résumé

On a étudié l'influence du porte-greffe sur les caractéristiques agronomiques, la teneur en éléments minéraux des feuilles et la composition des moûts de trois cépages de cuve chacun en deux localités. L'influence de plusieurs porte-greffes d'une même famille sur le développement végétatif et la composition des baies peut être très différente, les modifications induites dans les principaux paramètres des moûts n'apparaissant pas liées seulement à un différent degré de maturation ou à la vigueur végétative. L'importance du génotype est indiscutable, ainsi que la possibilité d'intéractions entre porte-greffe et greffon dans les différents procès de la maturation.

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