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Biological performance of grape varieties in Eastern Hungary

Rakonczás, N.

University of Debrecen, Faculty of the Agricultural and Food Sciences and Environmental Management, Institute of Horticulture 138. Böszörményi str., Debrecen, H-4032, Hungary

Summary: Eurasian and interspecific grape varieties and candidates were inspected for biological productivity in the variety collection of the University of Debrecen at the Horticultural Experimental Station in Pallag. In this paper, data are reported on yields (kg/stock), cane production (kg/ stock) and use-up index of wood yield of each cultivar in the experimental years 2011-2012. From the range of Eurasian (*Vitis vinifera* L.) white wine-grape qualified cultivars and candidates 'Ezerfürtű', 'Generosa', 'Jubileum 75', 'Müller Thurgau', 'Zöld veltelíni','B-11', 'CSFT-92', 'Pintes', from the range of Eurasian (*Vitis vinifera* L.) red wine-grape qualified cultivars and candidates 'Kármin', 'Pinot noir', 'Alicante Bouschet' and 'Rubintos' were highlighted. Promising data of interspecific 'Aletta', 'Csillám', 'Kunleány', 'Orpheus', 'Refrén', 'Taurus', 'Viktória gyöngye', 'Alföld 100', 'Reform', 'RF38/32', 'Toldi' white, and 'Dunagyöngye' 'Pannon frankos' red wine-grape cultivars and candidates were emphasized. Published data refer only to the biological performance of the cultivars. The thorough evaluation of varieties needs respect to data on resistance to fungal disease and climatic extremities, and other characteristics concerning production technology and oenological parameters.

Keywords: grape varieties, biological production, Y/N-ratio

Introduction

The total yearly wine production of our country is dynamically decreasing from the generally accepted 3 million hl, even down to 2,5 of 2011, and 1,8 of the vintage of 2012. The reason for this decrease could be searched in the background composed of many well-known world-economic tendencies, measures done by the leap forward in the name of environmentally sound plant protection technologies, global climate change, dynamic change of wine taste of the world and so on, which would be hard to tackle with even one by one (*Hajdu-Borbásné*, 2009; *Sidlovits,* 2008; *Eperjesi,* 2010).

The lower segment of the domestic wine market has lost its "appreciation", the pyramid of the domestic wine market is sensibly in collapse (*Kopcsay,* 2012). There became a huge niche emptied in the segment of the cheaper wines, which is "happily" filled up by Italian mass-wine producers (*Kopcsay,* 2012). However, it is important to say from the point of clear comprehension, that this quantity production does not directly mean lower wine quality. The theoretical bases are well circumscribed in works of *Csepregi* (1982) and *Diófási* (1985), followed by *Lörincz & Barócsi* (2009).

The cultivation of varieties highlighted in this work – or most of them – combined with adequate mechanization, production- and wine making technology, thanks to higher yields and the possibility of minimising costs of plant protection or reducing the highly damaging fungal diseases such as grape prudery mildew, mean a good opportunity for competitiveness to face the Italian imports (*Hajdu,* 2006; *Szőke,* 2006; *Füzi & Holb*, 2007; *Taksonyi* et al., 2010; *Holb & Füzi*, 2015).

An earlier paper deals with the oenological evaluation of some varieties of outstanding productivity (*Rakonczás,* 2011).

Most of the cultivars highlighted due to their outstanding data are lately ennobled and resistant. Since these varieties were created by the cross of *Vitis vinifera* and certain other traits of *Vitis* spp., these are called interspecific hybrids. Thanks to their character of being more or less resistant to fungal diseases on certain platforms these are referred to as "resistant" cultivars (*Zanathy* et al., 2005). The most novel distinction denominates them the PIWI-varieties (Pilzwiderstands-fähige Rebsorten) (*Morandell,* 2008).

According to the critique of the general comprehension a certain medicinal, or in case of red varieties a labrusca-taste is characteristic of wines of resistant wine-grape varieties. The formation of methanol by the process of downgrading pectin by pectin-methyl esterase represents a real weak point in the safety-evaluation of these varieties, and pushes back the spread of these vineyards.

By the adaptation of technological elements not detailed in this paper (such as superoxidization, the use of enzymes etc.) (*Maya*, 1994; *Szőke,* 2004; *Kállay-Nyitrainé*, 2004; *Eperjesi,* 2010; *Kállay,* 2010) many lately ennobled Hungarian resistant wine-grape varieties are published to be appropriate for quality wine production, and could

be acquitted of negative critics (*Phytowelt Gmbh*, 2003, *Nyitrainé* et al., 2011; *Hajdu*, 2013).

According to our observation there are more, mostly white qualified grape varieties and candidates, which show higher level in productivity. In its evaluation it is vital to clarify, that higher yield in itself cannot be judged, only together with corresponding data on cane-, that is, the vegetative production. A respective and thorough scientific literature was lied down by *Csepregi* (1982). The figure (Y/N) is the quotient of the yield (kg) and the cane production (kg), and its normal interval is between 3 and 6. However, it can greatly deviate from this range, according to the vegetative or generative character of the variety, to applied phytotechnical practices and the condition of the plantation. It is also important to respect that the derived data hides the real total biological productivity, since 10kg/5kg=2 and 2kg/1kg=2! In this context *Tomcsányi & Német* (1963) cit. *Csepregi* (1982) stated that variety is to be deemed valuable, of which the cane production between vintages does not show great variation, and in comparison to other cultivars, a considerably higher yield is harvested on the same level of cane production.

This work primarily aims to highlight varieties in our collection, which under the same conditions and production technology, show higher yields together with a considerably stable cane mass, thus the higher level of the yield does not result in the consequent decrease of vegetative production.

Materials and methods

The variety collection of the University of Debrecen was established in Pallag, on immune sandy soil, by 3m between row and 1m between stock spacing trained for single curtain stock form, with the use of European own rooted planting material, which is serious information from the point of view of the evaluation of data on productivity. Five stocks of each cultivar represent one experimental block.

Nutrition is carried out on the basis of the specific nutrient demand of the grape (Kozma, 1993) giving out 310 kg NPK (effective material) manure on yearly bases in two phases. Farmyard manuring is carried out every four years. Dripping irrigation system is built out in the plantation.

The following data were collected: yield (kg/stock), cane production (kg/stock), of which the Y/N-ratio, that is, the use-up index of wood yield is calculated (kg yield/kg cane).

Results

Table 1 does not list the whole variety collection, only those mostly interesting from the point of the present discussion. Besides outstanding cultivars, certain other varieties are also indicated, which are commonly cultivated.

Based on the yield data of 2011 and 2012 from the group of state qualified white European (*Vitis vinifera*) wine-grape cultivars 'Cserszegi fűszeres', 'Ezerfürtű', 'Generosa', 'Jubileum 75', 'Müller Thurgau', 'Szürkebarát', 'Zenit' and 'Zöld veltelíni' should be mentioned. The listed varieties can be characterised by a normal average cane production. Only 'Ezerfürtű', 'Generosa' and 'Jubileum 75' show higher vegetative production besides the outstanding yields, resulting in a normal Y/N-ratio. In the case of 'Cserszegi fűszeres', 'Müller Thurgau', 'Zenit' and 'Zöld veltelini', the higher generative production does not coincide with higher cane production.

From the group of European (*Vitis vinifera*) candidates 'B-11', 'CSFT-92', 'Kecskemét 13', 'Pintes' and 'Tarcal-4' are to be highlighted, of which 'CSFT-92' and 'Pintes' can be characterised with a simultaneous higher cane production. The vegetative production of 'Tarcal-4' is considerably low.

Looking at the data of red European (*Vitis vinifera*) wine-grape varieties, it is clear to see that in average, besides a considerably acceptable cane production – close to the general average – they show respectively lower yields resulting in a lower average Y/N-ratio.

Except for 'Pinot noir', 'Alicante Bouschet' and probably 'Zweigelt', 'Bíbor kadarka' and 'Merlot', it would be difficult to mention any of the red wine cultivars or candidates.

Table 2 shows data on interspecific wine-grape hybrids. It is basically good to see that there are several outstanding items in the group of white varieties and candidates, which results that the average yield production and Y/N-ratio are considerably higher than that of the qualified European (*Vitis vinifera*) varieties and intraspecific crossings.

In the group of qualified interspecific white wine-grape varieties 'Aletta', 'Csillám', 'Göcseji zamatos', 'Kunleány', 'Orpheus', 'Refrén', 'Taurus' and 'Viktória gyöngye' are to be mentioned for higher yields (close to 1.85 kg/m^2). It is interesting to notice that this higher yield is balanced by a cane production, which on its average is just the same as in the case of the European white wine-grape cultivars. However, there is a great difference between actual interspecific varieties. 'Aletta' shows higher, while 'Csillám', 'Kunleány', and 'Orpheus', show lower vegetative production.

In the group of white interspecific wine-grape candidates 'Alföld 100', 'Amadeus', 'Reform', 'RF38/32', and 'Toldi' are to be highlighted, of which, each variety is to be characterized by dominative vegetative production besides higher yields, thus their Y/N-ratio is considerably lower than that of the qualified interspecific white wine-grape varieties.

In the group of interspecific red wine-grape cultivars, there are only two items to be highlighted. These are 'Dunagyöngye' and 'Pannon frankos', both of which are to be characterised by a considerable vegetative overbalance, according to data.

Conclusion

Based on the data of 2011 and 2012 collected in the variety collection of the University of Debrecen, it is possible to nominate certain qualified varieties and candidates which would deserve more attention so that we can face wine-market problems detailed in the introduction.

Table 1. Harvest data of white and red European (*Vitis vinifera*) wine-grape varieties and candidates (Pallag, 2011–2012)

	Yields (kg/ stock)				Use-up index of wood yield (kg yield / kg cane)			Wood yield (kg cane / stock)		
Variety name	2011	1012	(yield/ stock)	(yield/ m2)	2011	2012	Average	2011	2012	Average
Eurasian white wine grape (Vitis vinif era L.) varieties and hybrids										
Qualif ied varieties										
Chardonnay	1,58	3,52	**2,55**	0,85	2,05	5,24	**3,65**	0,77	0,67	**0,72**
Cserszegi f űszeres	2,80	5,88	**4,34**	1,45	7,18	9,19	**8,18**	0,39	0,64	**0,52**
Ezerf ürtű	2,03	8,85	**5,44**	1,81	3,03	7,14	**5,09**	0,67	0,83	**0,75**
Generosa	2,40	7,84	**5,12**	1,71	2,29	8,97	**5,63**	1,05	0,87	**0,96**
Jubileum 75	4,74	6,92	**5,83**	1,94	6,81	7,08	**6,94**	0,70	0,98	**0,84**
Karát	3,00	4,68	**3,84**	1,28	4,02	5,85	**4,94**	0,75	0,80	**0,77**
Királyleányka	2,52	3,26	**2,89**	0,96	3,56	3,20	**3,38**	0,71	1,02	**0,86**
Korona	1,40	2,32	**1,86**	0,62	1,31	2,41	**1,86**	1,07	0,96	**1,02**
Műller Thurgau	3,60	5,50	**4,55**	1,52	4,62	8,81	**6,71**	0,47	0,62	**0,55**
Olasz rizling	1,62	2,36	**1,99**	0,66	5,79	6,59	**6,19**	0,28	0,36	**0,32**
Ottonel muskotály	2,18	5,44	**3,81**	1,27	2,57	6,34	**4,46**	0,85	0,86	**0,85**
Raj nai rizling	1,96	4,32	**3,14**	1,05	6,90	8,50	**7,70**	0,28	0,51	**0,40**
Rozália	2,26	4,20	**3,23**	1,08	3,98	7,00	**5,49**	0,57	0,60	**0,58**
Szürkebarát		5,92	**5,92**	1,97		10,35	**10,35**	0,82	0,57	**0,70**
Tramini	2,18	3,42	**2,80**	0,93	3,11	4,17	**3,64**	0,70	0,82	**0,76**
Zenit		5,94	**5,94**	1,98		9,00	**9,00**	0,46	0,66	**0,56**
Zöld veltelini	2,92	7,64	**5,28**	1,76	4,71	12,32	**8,52**	0,62	0,62	**0,62**
Average	**2,48**	**5,18**	**4,03**	**1,34**	**4,13**	**7,19**	5,98	**0,66**	**0,73**	0,69
Candidates										
B-11	3,56	9,42	**6,49**	2,16	7,04	16,47	**11,75**	0,51	0,57	**0,54**
CSFT-92	*	11,74	**11,74**	3,91		12,28	**12,28**	0,76	0,96	**0,86**
Kecskemét-13	2,34	6,58	**4,46**	1,49	4,68	9,91	**7,29**	0,50	0,66	**0,58**
Muscat Bouschet	4,20	2,42	**3,31**	1,10	4,16	2,94	**3,55**	1,01	0,82	**0,92**
Nosztori rizling	2,56	4,36	**3,46**	1,15	6,84	10,33	**8,59**	0,37	0,42	**0,40**
Pintes	4,52	7,00	**5,76**	1,92	4,35	12,32	**8,34**	1,04	0,57	**0,80**
Tarcal-4	5,50	3,92	**4,71**	1,57	19,23	8,48	**13,86**	0,29	0,46	**0,37**
Average	**3,78**	**6,49**	**5,70**	**1,90**	**7,72**	**10,39**	9,38	**0,64**	**0,64**	0,64
Eurasian red wine grape (Vitis vinif era L.) varieties and hybrids										
Qualif ied varieties										
Bíbor kadarka	2,76	3,56	**3,16**	1,05	3,63	4,40	**4,01**	0,76	0,81	**0,79**
Blauburger	2,35	1,95	**2,15**	0,72	2,24	4,15	**3,19**	1,05	0,47	**0,76**
Cabernet f ranc	1,52	3,08	**2,30**	0,77	1,25	2,04	**1,64**	1,22	3,78	**2,50**
Cabernet sauvignon	1,42	2,72	**2,07**	0,69	1,79	2,97	**2,38**	0,79	2,29	**1,54**
Dorur elder	1,62	4,27	**2,94**	0,98	4,38	7,49	**5,93**	0,37	0,86	**0,61**
Kadarka		1,14	**1,14**	0,38		1,01	**1,01**	0,86	2,83	**1,85**
Kármin	3,48	2,08	**2,78**	0,93	7,77	3,87	**5,82**	0,45	1,35	**0,90**
Kékf rankos	*****	*****1,96				3,07	**3,07**	0,38	1,60	**0,99**
Kék oportó	2,60	1,48	**2,04**	0,68	7,51	3,32	**5,42**	0,35	0,45	**0,40**
Merlot	2,18	4,40	**3,29**	1,10	4,20	4,85	**4,53**	0,41	0,54	**0,48**
Pinot noir	3,12	7,30	**5,21**	1,74	10,06	13,95	**12,01**	0,52	0,52	**0,52**
Zweigelt	2,26	4,78	**3,52**	1,17	5,00	9,68	**7,34**	0,45	0,49	**0,47**
Average	**2,33**	**3,34**	**2,78**	**0,93**	**4,78**	**5,06**	4,70	**0,63**	**1,33**	0,98
Candidates										
Alicante Bouschet	8,50	5,25	**6,88**	2,29	6,51	5,74	**6,13**	0,52	0,37	**0,44**
Cs.V. 420	1,42	4,12	**2,77**	0,92	2,29	6,75	**4,52**	0,62	0,61	**0,62**
Cs.V. 525	2,24	3,14	**2,69**	0,90	3,02	3,79	**3,41**	0,74	0,83	**0,79**
Kunrucvér	1,30	1,94	**1,62**	0,54	1,51	1,78	**1,65**	0,69	1,09	**0,89**
Medoc noir		3,10	**3,10**	1,03		11,65	**11,65**	0,24	0,27	**0,25**
Magyar f rankos	1,43	4,05	**2,74**	0,91	2,46	7,11	**4,78**	0,58	0,57	**0,58**
Miklóstelep 7	1,10	1,92	**1,51**	0,50	1,41	3,18	**2,30**	0,62	0,60	**0,61**
Rubintos	2,44	3,48	**2,96**	0,99	4,80	5,94	**5,37**	0,51	0,59	**0,55**
Average	**2,63**	**3,38**	**3,03**	**1,01**	**3,14**	**5,74**	4,98	**0,56**	**0,61**	0,59

* wasp damage (*Paravespula germanica, Vespa crabro*)
***** drought injury

European (Vitis vinifera) white wine-grape varieties and crossings: 'Cserszegi fűszeres', 'Ezerfürtű', 'Generosa', 'Jubileum 75', 'Müller Thurgau', 'Szürkebarát', 'Zenit', 'Zöld veltelíni', 'B-11', 'CSFT-92', 'Kecskemét 13', 'Pintes' and 'Tarcal-4'. European (*Vitis vinifera*) red wine-grape varieties: 'Pinot noir' and 'Alicante Bouschet'. Interspecific white wine-grape hybrids: 'Aletta', 'Csillám', 'Göcseji zamatos', 'Kunleány', 'Orpheus', 'Refrén', 'Taurus', 'Viktória gyöngye', 'Alföld 100', 'Amadeus', 'Reform', 'RF38/32' and 'Toldi'. Interspecific red wine-grape hybrids: 'Dunagyöngye' and 'Pannon frankos'.

Table 2. Harvest data of interspecific white and red wine-grape hybrids (Pallag, 2011-2012)

	Yields (kg/ stock)				Use-up index of wood yield (kg yield / kg cane)			Wood yield (kg cane / stock)		
Variety name	2011	1012	(yield/ stock)	(yield/ m2)	2011	2012	Average	2011	2012	Average
Interspecif ic hybrids										
White wine-grape varieties										
Qualif ied varieties										
Aletta	5,60	8,76	**7,18**	2,39	8,62	8,28	**8,45**	0,65	1,06	**0,85**
Bianca	1,20	6,52	**3,86**	1,29	1,46	7,80	**4,63**	0,82	0,84	**0,83**
Csillám	7,34	6,48	**6,91**	2,30	18,26	16,70	**17,48**	0,40	0,39	**0,40**
Göcsej i zamatos	3,14	6,78	**4,96**	1,65	5,00	10,46	**7,73**	0,63	0,65	**0,64**
Kunleány	2,88	6,26	**4,57**	1,52	4,73	15,05	**9,89**	0,49	0,42	**0,45**
Odyssens	****	3,04	**3,04**	1,01		7,04	**7,04**	0,56	0,43	**0,50**
Orpheus	2,70	6,94	**4,82**	1,61	7,34	12,76	**10,05**	0,37	0,54	**0,46**
Ref rén	6,18	6,92	**6,55**	2,18	8,68	10,78	**9,73**	0,71	0,64	**0,68**
Taurus	0,78	10,26	**5,52**	1,84	1,11	16,50	**8,80**	0,70	0,62	**0,66**
Viktória gyöngye	6,60	9,56	**8,08**	2,69	10,89	13,86	**12,37**	0,61	0,69	**0,65**
Average	**4,05**	**7,15**	**5,55**	**1,85**	**7,34**	**11,92**	**9,62**	**0,59**	**0,63**	**0,61**
Candidates										
Alf öld 100	**** 1,08	4,56	**4,56**	1,52	1,01	5,23	**3,12**	1,07	0,87	**0,97**
Amadeus	****	5,16	**5,16**	1,72		8,84	**8,84**	0,80	0,58	**0,69**
Kristály	1,78	6,16	**3,97**	1,32	1,32	5,31	**3,31**	1,35	1,16	**1,26**
Kunbarát	3,76	3,36	**3,56**	1,19	5,75	4,93	**5,34**	0,65	0,68	**0,67**
Ref orm	*	6,52	**6,52**	2,17		8,56	**8,56**	0,81	0,76	**0,79**
Rf -38/32	4,40	9,76	**7,08**	2,36	5,08	11,84	**8,46**	0,87	0,82	**0,85**
Toldi	9,30	10,70	**10,00**	3,33	10,15	14,62	**12,39**	0,92	0,73	**0,82**
Vértes csillaga	2,08	3,90	**2,99**	1,00	4,08	5,89	**4,98**	0,51	0,66	**0,59**
Average	**4,26**	**6,27**	**5,48**	**1,83**	**4,56**	**8,15**	**6,87**	**0,87**	**0,78**	**0,83**
Red wine-grape varieties										
Qualif ied varieties										
Duna gyöngye	3,14	**8,60**	**5,87**	1,96	5,79	**26,38**	**16,09**	0,54	0,33	**0,43**
Korai bíbor		2,94	**2,94**	0,98		5,10	**5,10**	0,54	0,58	**0,56**
Medina	2,21	3,78	**3,00**	1,00	6,83	5,66	**6,24**	0,45	0,67	**0,56**
Pannon f rankos	**** 1,76	5,38	**5,38**	1,79	5,57	7,75	**6,66**	0,32	0,69	**0,51**
Turán	2,00	4,94	**3,47**	1,16	3,41	6,77	**5,09**	0,59	0,73	**0,66**
Average	**2,45**	**5,13**	**4,13**	**1,38**	**5,40**	**10,33**	**7,84**	**0,49**	**0,60**	**0,54**
Candidates										
Regent	1,10	2,03	**1,57**	0,52	2,23	3,96	**3,09**	0,82	0,51	**0,67**
Tizian	1,80	4,94	**3,37**	1,12	2,95	6,38	**4,67**	0,61	0,77	**0,69**
Average	**1,45**	**3,49**	**2,47**	**0,82**	**2,59**	**5,17**	**3,88**	**0,72**	**0,64**	**0,68**

* wasp damage (*Paravespula germanica, Vespa crabro*)
**** late spring frost damage

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