STUDIES OF TECHNICAL RED GRAPE VARIETIES AND CLONES IN ANAPA-TAMAN AREA OF KRASNODAR REGION

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Abstract: technical cultivars of grape and the influence of enzyme preparations on the quality of must and wine has been studied in Anapa-Taman area. In materials submitted to analysis of meteorological conditions Anapa-Taman area, the phenological obser\'ations, agrobiological and mechanic evaluation of the cultivars and clones. Also presents an analysis of the influence of enzyme preparations on the composition of must and vine.

Key words: technical varieties, clones, enzyme preparations, titratable acidity, phenolic compounds, extractivitv.

The most favorable areas are oriented toward on the quality winemaking. At present, the increased need for replenishment of the assortment of grapes. Improving the assortment can be implemented through the introduction of new clones of the classic varieties, as well as through the use of highly adaptive varieties of domestic selection [11, 12]. It is also necessary to look for ways to improve the quality of wines by the use of technology, such as the use of exogenous fermented pulp/must. This technological method allows us to more folly exploit the potential of varieties and clones [3].

Tbe aim of our research conducted in Anapa-Taman area of Krasnodar region was a comparative study of various technical red varieties and clones, as well as to study the effect of different enzyme preparations on the quality of the wines from them.

Materials and methods

The studies were conducted in 2010-2011 years in the Anapa Zonal Experimental Station of Viticulture and Wine, North Caucasus Zonal Research Institute of Horticulture and Viticulture and the Department of viticulture and winemaking RSAU - MTAA named after K.A. Timiryazev. The main objects of experimental study were: grapes, pulp, must and wine from grapes of the following varieties: Cabernet AZES, Cabernet Sauvignon, Cabernet Franc, Merlot.

Field experiments were performed in elite liquor Anapa Zonal Experimental Station of Viticulture and winemaking. The ground area - calcareous chernozem. The humus

horizon (A-B) is 60-80 cm [6]. The climate is mild, falling to 450 mm of rainfall. The frost-free period - up to 190 days, the sum of active air temperatures 3500-3700°C. Hydrothermal coefficient is equal to 0,8-1,1 [1,2]. Winters are warm with average monthly temperature in January +1,1°C. Summer is hot and dry. The average monthly temperature in July is 23,4°C. Number of hot winds of low intensity does not exceed 20-24 days during the growing season.

The studied varieties and clones of grapes were planted in 2006 grafted seedlings. Used as rootstock Richter 110. Forming - dvuhplechy Cordon Cazenave. The scheme of planting 3,0 x 1.5 m. Culture is not a covering, nonirrigated.

Estimations were performed on thirty bushes of each variety or clone, were taken three replications, in each replication were taken from 10 bushes. Phenological observations were carried out by the method of M.A. Lazarev (1963) [7]. Mechanical analysis of the harvest were carried out according to the method of N.N. Prostoserdova "Study of grapes to determine its use (Uvologiya)", 1963 [9]. Productivity shoots was determined by the method of A.M. Amirdzhanova and D.S. Suleymanova [4]. Evaluation of meteorological conditions of the annual cycle of grapes was carried out according to data weather station, located on the territory of ampelographic collection. The dynamics of sugar content of fruit juice was determined by refractometric method, and during the ripening of grapes - aromethrics. Acidity - titration with 0,1 N solution. Mathematical data processing was conducted by the dispersion method of V.A. Dospehov (1979).

Processing of grapes was conducted in the North Caucasus Zonal Research Institute of Horticulture and Viticulture (Krasnodar), in mikrowinemaking. We used following preparations:

LAFAZYM PRESS («Laffort», Bordeaux, France) - Purified pectolytic enzyme preparation for optimising pressing and extraction of aroma precursors during the production of wines. Dose - 0.6 g /1

- Optimises pressing by increasing free-run juice yields and by decreasing the length of time and the number of pressing cycles.
- Encourages aroma and precursor extraction. Use directly on the grapes during press filling.
- Cinnamyl esterase purification (avoids volatile phenol formation).

FILTROZYM («Laffort», Bordeaux, France) - enzyme preparation, with pectinase and beta-glucanase activity. This preparation facilitates the operation of filtration and improves fining of wines. And allows to facilitate considerably clarification and to increase filterability of wines, deletes the colloids, being in a suspension (pectins and глюканы). Dose - 0,6 g/1.

EXTRAZYM («Enolodzhi», Epemay, France) - pectolytic enzyme preparation. It promotes the extraction of phenolic components from the grape skins, in the process of maceration and in vinification rapid extraction of anthocyanins. It significantly improves the intensity of the color, and organoleptic qualities of wines obtained. Dose - 0.3 g /1.

INOZYM («Enolodzhi», Epemay, France) - pectolytic enzyme preparation dried high purity, which accelerates the decantation of suspensions in the must. The preparation includes the activities: pectin-transeliminaza, polygalacturonase, pektinesteraza, hemicellulase. These enzymes hydrolyze neutral and acidic pectic substances contained in the cellular tissue, which speeds up the process of clarification of the must. Dose - 0.2 g /1.

We used the yeast IOC Prestige ("Enolodzhi", France). Dose - 20 g / hi. Enzyme preparations was introdused at the stage of pulp/must, with concentrations recommended by the manufacturer.

The following methods of analysis is used to assess the physico-chemical properties of wine production:

- mass concentration of sugars, reduced extract, titratable acids, volatile acids, total sulfur dioxide, the volume fraction of ethyl alcohol - on the current normative documents: standard - GOST 13192, GOST 51620, GOST 51654, GOST 51655, GOST 51653;
- the study of qualitative and quantitative composition of phenolic compounds was performed by the colorimetric method.

Results of studies

Critical temperatures below zero observed in the winter of 2010 (at the end of January (-22°C) with a strong wind). Temperature was favorable in the subsequent.

Summer characterized by rainy weather in June and dry, with temperatures reaching 28-35°C, in July - August. Low temperatures of winter months, and then the spring, supplemented by heavy rainfall in April of 2011. The summer was hot and dry. Beginning of the growing season was characterized by earlier timing than the multiyear averages, which was associated with a favorable temperature regime in mid - April of 2011. Flowering took place under optimum conditions, the temperature almost did not exceed 25°C, shedding of flowers in the inflorescences were not observed. However, excessive rainfall led to a delay in the start of ripening fruit in the studied cultivars and clones in late of June. Phase of bud burst and flowering phase of the varieties and clones were displaced for about two weeks in 2011, due to colder temperatures in spring months, as well as heavy rainfall during this period, especially in April.

Temperature conditions, the amount of rainfall the summer months, in line with the average long-term data, so the phase of maturation, the majority of varieties and cloneswas observed at the usual time. The lowest number of days from bud to maturity wasrented from Merlot 349 - 134 days, with the greatest Cabernet AZES - 146 days [8].

The percentage of blossom buds (table 1) was 87-93% for all studied varieties and clones, with the exception of the control varieties Cabernet Sauvignon, which showed the lowest bud - 57%. The highest percentage of blooming is Cabernet AZES (93%). Agrobiological counts of genotypes studied showed a fairly large crop of potential, it evidenced by the coefficients of fruiting and fruitfulness. The highest rates of fruiting and fruitfulness observed in Cabernet Sauvignon 338 and Merlot 349 (1,5 and 1,8). Significant differences were observed in terms - the average weight of the bunch. The largest cluster was a Cabernet AZES (average weight 284 g). Most small clusters of average weight 169 g had clone of Cabernet Sauvignon 338.

The highest yield per bush showed Cabernet AZES (8,3 kg) and Merlo 349 (8,6 kg). The lowest yield per bush (3,0 kg), respectively, and the lowest yield per 1 ha (67 kg / ha) showed control. As productivity escape distinguished Merlot 349 (330 g).

The largest berries were characterized at the intraspecific hybrid Cabernet AZES (1,9 g). The smallest berry is noted at Cabernet Sauvignon 338 and Cabernet Sauvignon, the average weight of berries, which was 1,4 g, according to the results of mechanical analysis (table 2).

Treatment of enzyme preparations contributed to the changes in the qualitative characteristics of wine varieties and clones studied.

Influence of enzyme preparations on the qualitative composition and quantitative content of components of the chemical composition of wine was studied by us.

To evaluate the effectiveness of enzyme preparations as a test - accepted indicators: the content of ethanol, titratable acidity, the mass concentration of extractives, the mass concentration of phenolic compounds, the mass concentration of anthocyanins. The data obtained are presented in table 3.

Table 1

Agrobiological characteristics of the studied cultivars and clones (2010-2011)

Indicators	Cabernet Sauvignon	Cabernet AZES	Cabernet Franc 327	Cabernet Sauvignon338	Merlot 349	NCR 05
Load eyes, pieces	19	34	27	27	29	
Developed shoots, pieces	11	32	24	23	26	
Blooming buds, %	57	93	89	87	88	11
Fruit-bearing shoots, pieces	10	20	18	20	22	
Inflorescences, units	16	29	28	35	40	
Coefficient of fruiting	1,4	0,9	1,2	1,5	1,5	0,2
Coefficient of fruitfulness	1,6	1,4	1,6	1,8	1,8	0,2
The average mass of clusters, g	185	284	186	169	221	24
Productivity shoots, g	259	259	224	258	330	
Harvest from the bush, kg	3,0	8,3	5,2	5,9	8,6	1,5
Yield, kg / ha	67	184	115	132	191	33,3

Table 2

Mechanical harvest of the studied grape varieties and clones

Variety, clone	The average weight berries, g	Share in the cluster,%			
		crest	Peel with pulp	seeds	juice
Cabernet Sauvignon	1,4	7,8	18,6	5,0	68,6
Cabernet AZES	1,9	5,7	14,5	3,8	76,1
Cabernet Franc 327	1,6	5,2	14,1	5,8	74,9
Cabernet Sauvignon338	1,4	6,5	15,8	4,4	73,4
Merlot 349	1,5	5,4	18,4	4,7	71,5

The influence of preparations depended on the variety and type of enzyme. Alcoholicity - the main indicator of the quality of natural wines. It depends on the initial sugar content of fruit juice. Wine from Merlot clone 349 was characterized by the highest alcoholicity (without treatment used preparations). The applied preparations had little effect on the alcohol content of wines obtained - in most cases the differences were not significant.

Titratable acidity - one of the key components of quality wines. Natural wines with relatively high acidity preserve quality during storage. The test preparations led to an increase in titratable acidity of the wines (Cabernet Franc - the exception). Filtrozym and extrazym showed a high effect on Cabernet AZES. Lafazym and extrazym showed a high effect on Cabernet Sauvignon clone 338. Filtrozym, extrazym, lafazym and inozym - on Merlot 349.

Extractivity of red wine is an important indicator of quality. Red wine is characterized by a high extractivity, than whites. Extractive wines are characterized by a high concentration of biologically active compounds, characterized by a longer period of storage [5].

Effect of preparations on the rate depended on the variety, clone and type of the enzyme. Filtrozym showed the highest efficiency on the Cabernet AZES and Cabernet

Table 3

Effect of enzyme preparations on the chemical composition of table wines (2010-2011)

Enzyme	Ethanol, %	Titratable acidity, g/dm³	Extract, g/ dm³	Amount of phenolic compounds, mg/ dm³	Anthocyanins, мг/ дм³
Cabernet AZES					
Lafazym	10,79	7,29	24,9	2255,1	372,8
Filtrozym	10,93	7,36	24,6	2143,0	384,8
Extrazym	11,18	7,37	25,2	2355,9	435,8
Inozym	10,93	7,08	24,2	2130,0	375,7
Monitoring	10,99	6,84	23,8	2207,0	405,4
NSR 05	$F_ф < F_т$	0,21	0,53	93,5	$F_ф < F_т$
Cabernet Sauvignon338					
Lafazym	11,59	7,42	24,7	1987,2	318,5
Filtrozym	10,97	7,09	27,5	1986,2	320,2
Extrazym	11,38	7,33	25,8	2107,3	340,9
Inozym	11,63	7,06	24,6	2043,9	330,9
Monitoring	11,92	7,03	23,8	2011,5	333,0
NSR 05	$F_ф < F_т$	0,28	0,55	88,7	$F_ф < F_т$
Cabernet Franc 327					
Lafazym	11,71	6,42	23,2	1664,4	159,3
Filtrozym	11,38	6,28	23,5	1733,6	196,8
Extrazym	11,18	6,77	25,6	1951,2	196,7
Inozym	11,46	6,63	23,6	1880,0	214,1
Monitoring	11,41	6,53	23,8	1871,8	248,7
NSR 05	$F_ф < F_т$	$F_ф < F_т$	0,60	90,8	63,0
Merlot 349					
Lafazym	12,90	7,28	28,3	2380,1	230,3
Filtrozym	12,78	7,23	27,5	2296,8	232,8
Extrazym	12,81	7,26	28,3	2401,8	256,4
Inozym	12,79	7,24	27,8	2359,3	278,9
Monitoring	13,46	6,48	25,3	2128,4	286,4
NSR 05	$F_ф < F_т$	0,35	0,73	95,7	$F_ф < F_т$

Franc 327. Inozym showed the highest efficiency on Cabernet Sauvignon 338. Filtrozym, extrazym, lafazym and inozym - on Merlot 349 (fig. 1).

Phenolic and aromatic compounds of grapes are the main components that determine the quality of the consumer in the future of red dry wine. The total mass concentration of phenolic compounds in red table wine should be varied in the range 1500-3400 mg/dm³ [10]. Intensification of extraction of phenolic and aromatic compounds, which are localized in the skin of grapes, using enzyme preparations led to a change in the nature of the content of phenolic substances in wine varieties under study. Cabernet AZES and Merlot 349 were characterized by the highest content of phenolic compounds.

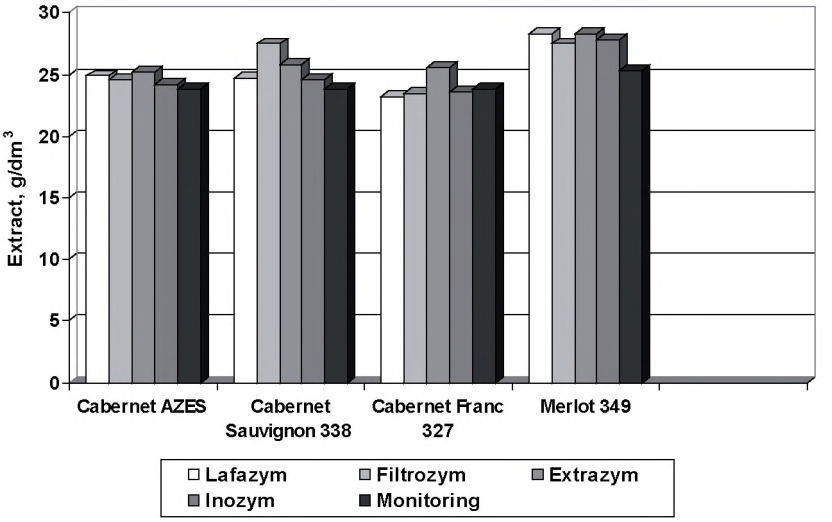

Fig. 1- Effect of enzyme preparations to extractivity of wines of different grape varieties, 2010-2011

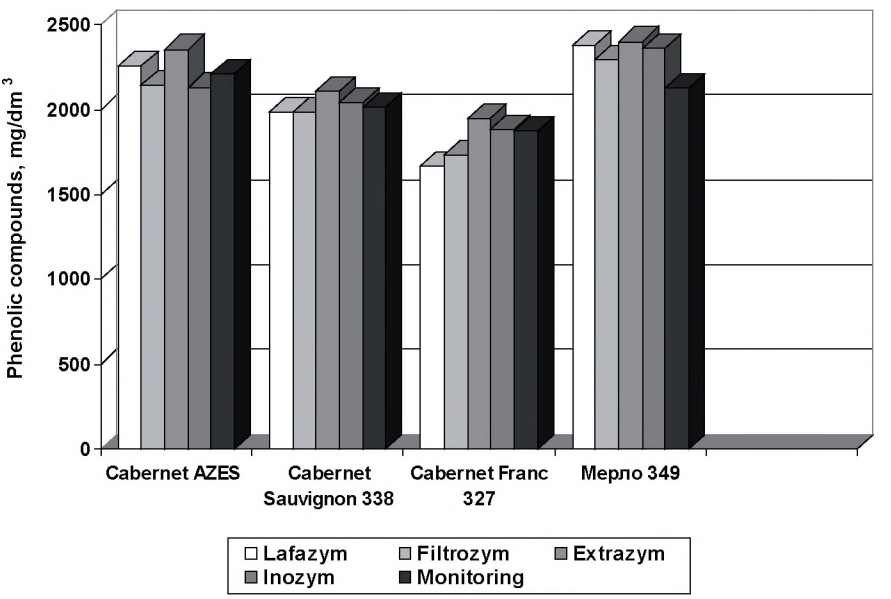

Fig. 2. Effect of enzyme preparations on the content of phenolic compounds in wine of different grape varieties, 2010-2011

The effectiveness depended on the variety and preparation used. Extrazym showed the highest efficiency. The use of this preparation increased the mass concentration of phenolic compounds in wine as compared to control, Cabernet AZES from 6,7%, Cabernet Sauvignon 338 - 4,8%, Cabernet Franc 327 - 4,2%, Merlot 349 - 12,8%. Lafazym characterized by relatively low efficiency (fig. 2).

Conclusion

1. The growing season is dependent on years of research and genotype. All the studied grape varieties and clones were mid-late and late period of ripening berries.

2. All the studied clones showed a high potential productivity. The highest level of productivity shoots showed Merlot 349, the yield stood out Merlot clone 349 and cultivar of local origin Cabernet AZES.

3. The use of enzyme preparations affected the biochemical composition of wines. The effectiveness of the influence of enzyme preparations on the biochemical composition of wines depend on the variety (clone) and type of enzyme. The highest levels of phenolic compounds in wine is marked when using extrazym.

References

I. Agroclimatic reference for the Krasnodar Territory. Krasnodar: Vol. Press, 1961. 467 p.

2 Agroclimatic resources of Krasnodar region. Leningrad: Gidrometeoizdat, 1975. 276 p.

3. *Alekhina VP.* Effect of enzyme preparations on the yield of the must // Winemaking and Viticulture USSR, 1964. № 7. P. 18-23.

4. *Amirjcmov A.M., Suleymcmov D.S.* Assessing the productivity of grapes and vineyards [Text] / A.M. Amiijanov, D.S. Suleymanov // Baku, 1986. 56 p.

5. *Chaplygin A. V, Ageev N.M., Odarchenko VY.* Phenolic compounds of natural dry wines, depending on the production technology // Winemaking and viticulture, 2006. № 2. P. 31-32.

6. *Kurkaev V.T., Sheudzhen A.H.* Agrochemicals. Maikop, 2000.

7. *Lazarev M.A.* The study of grape varieties [Text] / M.A. Lazarev // Rostov-on-Don, 1963. 76 p.

8. *Pankin ML, Radjabov A.K., Maksimov R.A., Volkova E.V* Reports of the TAA: Collected papers. Edition 283. Part I. Moscow: Press RSAU-MTAA named after K.A. Timiryazev, 2011. P.640-644.

9. *Prostoserdov N.N.* The technological characteristics of grapes and its processed products (Uvologiya) / M.A. Lazarev, N.N. Prostoserdov. Moscow, 1946. 402 p.

10. The preparation of wines using grapes produced by biological fanning technical and economic stakes [Text] /Revue Francaise d'Enologie, Special file. France, 2000. № 180. P. 11-29.

II. Viticulture in Russia: Present and Future // E. Egorov, A. Adzhiev, K. Serpuhovitina, L. Troshin, A. Zhukov, S. Guseinov, A. Aliyev. Makhachkala: Publishing House "New Day", 2004. 440 p.

12. *Yakimenko E.N.* Biological value and quality of wines from the Kuban introduced grape varieties and clones of the global breeding / T.I. Guguchkina, A.V. Prakh, B.V. Chigrik, M.A. Gruner // Krasnodar, 2008. 178 p.

ИЗУЧЕНИЕ КРАСНЫХ ТЕХНИЧЕСКИХ СОРТОВ ВИНОГРАДА И ФЕРМЕНТНЫХ ПРЕПАРАТОВ В УСЛОВИЯХ АНАПО-ТАМАНСКОЙ ЗОНЫ КРАСНОДАРСКОГО КРАЯ

Аннотация: в условиях Анапо-Таманской зоны проводилось изучение различных клонов красных технических сортов, а также влияния обработки сырья различными ферментными препаратами на качество сусла и виноматериалов. В материалах представлен анализ условий в период проведения исследований, результаты фенологических наблюдений, агробиологическая и увологическая оценки изучаемых сортов и клонов. Показано влияние ферментных препаратов на состав сусла.

Ключевые слова: технические сорта, клоны, ферментные препараты.

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