Agrobiological and phenological characteristics of Dagestan aboriginal grape varieties in the conditions of the Krasnodar region

B A Feyzullaev[1*]

[1]FGBNU "Dagestan Breeding Experimental Station for Viticulture and Vegetable Growing" - branch of the FGBNU "North Caucasus Federal Scientific Center for Horticulture, Viticulture and Winemaking", Russia

Abstract. Native varieties have a number of positive characteristics that are widely used in the breeding process. Among them are varieties of very early ripening (Yay izyum white and Yay izyum pink), medium ripening (Ag izyum, Khatmi), late ripening (Agadai, Koz izyum), etc. The purpose of the research is to study the influence of weather conditions on agrobiological indicators and the onset of phenological phases of the grape plant. The experiment included 14 Dagestan native grape varieties of different ripening periods and directions for using the crop in the conditions of the Anapa zonal experimental station of viticulture and winemaking. The research has established: one variety of very early ripening (Ag emchek); 5 early ripening varieties (Khotsa tsibil, Budai Shuli, Chaush novyy, Khatmi); 7 early-medium varieties (Ag chakrak, Ag raisin, Gimra, Dagestan, Dzhagar, Dokur, Dubut) and 1 late-ripening variety (Chil Gulyabi). Agrobiological indicators and indicators of crop quality were also determined. The number of inflorescences per one developed shoot (K1 - fruiting coefficient) is the lowest in the Budai Shuli variety - 0.55, and the highest in the Gimra variety - 1.74. For other varieties it ranges from 0.61 to 1.56. According to the fruiting coefficient (K2), the varieties Gimra and Khotsa tsibil are also distinguished (1.90 and 1.71, respectively). For other varieties of oats, this indicator ranges from 1.23-1.68.

1 Introduction

Dagestan, having great indigenous genetic potential and long-standing traditions of grape cultivation, has real opportunities to significantly increase the production of grapes for fresh consumption and for industrial processing. Over the long history of viticulture in Dagestan, local grape varieties were created based on wild grapes.

Local table varieties, along with high productivity, also have a number of other valuable properties. The Yai raisin white and pink variety is characterized by a very early ripening period. Ag raisins and Khatmi - medium ripening. One of the most common varieties remains Agadai, which is highly transportable. Goat raisins are very late ripening,

* Corresponding author: karaev1955@mail.ru

transportable, shelf-stable, valuable for extending the period of consumption of fresh grapes.

With appropriate placement of local varieties for technical processing, they provide not only high yields, but also good quality. Varieties such as Khatmi, Narma, Gulabi Dagestan, when grown on foothill slopes or on light sandy soils, produce high quality wines. In the southern lowlands, good quality wines were provided by the Makhbor Tsibil and Gimra varieties.

Autochthonous varieties, most of which have only local distribution or are represented in a limited number in various ampelocollections, can be irretrievably lost, and these genotypes can carry rare alleles, having high adaptive properties to specific viticulture zones. As a result, special attention is paid to the study of the indigenous gene pool in all grape-producing countries [4, 7, 9, 12].

2 Materials and methods

The work was carried out on grape varieties Ag chakrak, Ag-raisin, Ag-emchek, Budai shuli, Gimra, Dagestansky, Dzhagar, Dokur, Dubut, Khatmi, Khotsa cibil, Chaush new, Chil Gulyabi, Emchek raisin, growing in the collection of the Dagestan breeding experimental station viticulture and vegetable growing related to the indigenous varieties of Dagestan [5-6]. The studies included both local, quite common in the Republic of Dagestan, and rare varieties (Table 1)

Agrobiological surveys and phenological observations were carried out according to generally accepted methods [2].

3 Results and Discussion

The introduction of new promising grape varieties into production requires their comprehensive long-term study under specific cultivation conditions, especially under different weather conditions, which vary the most. A long-term study of the timing of the phenological phases of development of grapes of different varieties makes it possible to predict their onset in accordance with weather conditions and carry out agrotechnical measures in a timely manner.

Many authors note that the timing of the phenophases of grapes in a particular place of its growth depends mainly on the temperature regime and moisture supply [1-2].

In 2015-2020 We observed the passage of 6 main phases of 14 indigenous grape varieties of different directions and different ripening periods. The work was carried out at the collection site of the Anapa zonal experimental station of viticulture and winemaking under the generally accepted wide-row, high-standard crop in the area and typical soil, climatic and relief conditions. Weather conditions during the years of research were varied, which allowed us to analyze the differences in the timing of grape phenophases by variety and year over 5 years and identify patterns and their relationships. Phenology was carried out according to the phases of vegetation and the dormant period (Table 1).

Our research has established that sap flow in all varieties begins in the second ten days of March (March 13-29), buds bloom from April 14 to 22, the beginning of flowering is noted from June 1 to June 6, and the beginning of berry ripening from July 5 (Ag emchek) and July 26 (Dagestan, Gimra.) Full physiological ripeness occurs on August 6 (Emchek raisins) and September 4 Chil Gulabi. In most varieties, full physiological ripeness occurs between August 10 and August 21. At the same time, the harvest of both table and technical varieties is formed (the period from the moment of bud break to harvest) on average, respectively, from 95 to 143 days. From the beginning of sap flow to the beginning of bud

bloom, an average of 18 to 28 days pass. And from the beginning of buds to the beginning of flowering within 50 days (35% of the duration of the entire period of crop formation. The period from the beginning of flowering to the beginning of berry ripening is from 33 days (Ag emchek) to 56 days (Chil Gulyabi). The ripening phase lasts from 22 to 35 days.

Agrobiological observation data are given in Table 2.

Table 1. The passage of phenophases of indigenous grape varieties in the conditions of the southern coastal zone (average for 2015-2020).

Variety	Beginning of the phase				Maturation of shoots	Full physiological ripeness	End of shoot growth	Growing season, days
	sap flow	Budding	flowering	Ripening berries				
Ag chakrak	16.03	16.04	04.06	24.07	12.08	14.08	25.08	120
Ag-izyum	17.03	18.04	03.06	06.08	01.08	21.08	04.09	125
Ag-emchek	20.03	14.04	02.06	05.07	11.07	18.07	20.08	95
Buday shuli	24.03	20.04	02.06	18.07	14.07	11.08	01.09	113
Gimra	20.03	14.04	03.06	26.07	08.08	15.08	20.08	123
Dagestan	20.03	16.04	05.06	26.07	04.08	18.08	02.10	124
Jagar	20.03	18.04	06.06	20.07	15.08	18.08	05.09	122
Dokur	19.03	14.04	01.06	23.07	10.08	15.08	01.09	123
Dubut	19.03	20.04	05.06	24.07	03.08	20.08	22.08	122
Khatmi	13.03	16.04	02.06	24.07	22.08	10.08	14.09	116
Khotsa tsibil	20.03	22.04	06.06	24.07	10.08	11.08	14.09	111
Chaush novyy	20.03	22.04	05.06	24.07	22.07	15.08	21.08	115
Chil Gulyabi	29.03	14.04	05.06	01.08	04.08	04.09	10.09	143
Emchek izyum	15.03	15.04	02.06	20.07	04.08	06.08	19.08	113

Table 2. Agrobiological indicators of indigenous grape varieties in the AzoSViV collection (average for 2015-2020).

Variety name	Eyelets left, pcs.	Shoots developed, pcs.			Number of inflorescences, pcs.	K_1	K_2
		Total	Incl. fruitful				
			pcs.	%			
Ag chakrak	54.0	39.0	30.0	76.9	37.0	0.95	1.23
Ag-izyum	50.5	43.0	22.0	51.2	37.5	0.86	1.68
Ag-emchek	45.0	38.5	32.0	83.1	47.0	1.24	1.46
Buday shuli	40.5	29.5	14.5	49.2	16.5	0.55	1.14
Gimra	34.0	34.0	31.0	91.2	59.0	1.74	1.90
Dagestan	36.0	18.5	8.0	43.2	11.0	0.61	1.38
Jagar	26.5	17.0	8.5	50.0	11.0	0.65	1.38
Dokur	37.5	34.5	25.0	72.4	35.0	1.03	1.40
Dubut	48.5	40.0	28.5	71.2	44.0	1.10	1.57
Khatmi	45.0	29.0	24.0	82.6	36.0	1.24	1.50
Khotsa tsibil	30.0	26.5	24.0	90.5	41.5	1.58	1.71
Chaush novyy	31.5	11.0	8.5	77.2	11.5	1.0	1.38
Chil Gulyabi	33.0	12.0	5.0	41.6	8.0	0.66	1.60
Emchek izyum	48.0	31.0	18.5	59.6	23.5	0.74	1.28
HCP_{05}						0.09	0.11

When pruning and loading the bushes, the growth force of the bushes was taken into account. As a result, the Ag Chakrak variety had the highest load of bushes with eyes - 54 pcs. and the smallest for the Jagar variety - 26.5 pcs. For other varieties, the load varied from 30.0 to 50 buds. According to the number of developed shoots, the varieties Ag izyum, Dubut, Ag chakrak and Ak emchek stand out (43.0; 40.0; 39.0 and 38.5,

respectively). According to the number of fruitful shoots, the varieties Ag emchek, Gimra, and Dubut stand out. The percentage of fruitful shoots ranges from 41.6 to 91.2%. A high percentage of fruitful shoots is found in the varieties Gimra, Khotsa Tsibil, Ak emchek and Khatmi (91.2; 90.5; 83.1 and 86.2).

According to the indicators of fruiting (K_1) and fruitfulness (K_2), the varieties Gimra, Khotsa Tsibil, Khatmi, Dubut are distinguished. Data on the yield of the studied varieties and their quality are presented in Table 3.

Table 3. Harvest and quality of grapes of the studied varieties (average for 2015-2020).

Variety name	Number of bunches, pcs.	Bunch weight, g	Harvest		Mass concentration	
			from 1 bush, kg	1 ha, t	sugars, g/100cm^3	Acids, g/dm^3
Ag chakrak	37.0	370	13.7	19.5	16.5	7.0
Ag-izyum	37.5	180	6.7	9.5	20.0	7.0
Ag-emchek	47.0	420	19.7	28.1	18.0	8.0
Buday shuli	16.5	230	3.68	5.3	21.5	7.6
Gimra	59.0	280	16.5	23.6	20.0	7.6
Dagestan	11.0	560	6.2	8.8	17.9	7.6
Jagar	11.0	510	5.6	8.0	19.4	7.7
Dokur	35.0	420	14.7	21.0	17.9	7.6
Dubut	44.0	330	14.5	20.7	17.0	7.0
Khatmi	36.0	320	11.5	16.4	17.0	6.0
Khotsa tsibil	41.5	270	11.1	15.8	18.0	6.0
Chaush novyy	11.5	430	4.73	6.8	17.0	7.3
Chil Gulyabi	8.0	530	4.24	6.0	17.6	7.0
Emchek izyum	23.5	280	6.44	9.2	15.0	8.9
HCP_{05}		221		3.44		

As can be seen from the data obtained, the varieties vary greatly in average bunch weight. Such varieties as Dagestansky, Chil Gulyabi, Dzhagar, Chaush novyy, Dokur, Ak emchek had fairly large clusters. The main influence on the yield is the number of bunches and their average weight. There is a noticeable close correlation between the number of bunches and the yield per bush, which is expressed by the regression equation $y = 0.284x + 1.8289$ with $r = 0.84$. The influence of the mass of a bunch on the yield from a bush is expressed by the equation $y = 0.0013x + 10.769$ with $r = 0.028$, which indicates a weak influence of the mass of a bunch in this case on the yield from a bush. The varieties Ak emchek (28.1 t), Gimra (23.6 t), Dokur (21.0 t), Dubut (20.7 t) had high yields per bush, and accordingly per hectare. In terms of mass concentration of sugars and total acids, all studied varieties provide the required concentrations.

4 Conclusion

Based on the conducted research, the following conclusions were made:

- According to the timing of ripening, the studied varieties in the conditions of the southern coastal zone are divided into four groups: very early, early, early-mid and late.
- In terms of yield, the following varieties stand out: Ag emchek - 28.1t, Gimra - 23.6t, Dokur - 21.0t. The main influence on yield is the number of bunches on the bush. The effect of bunch weight is insignificant.
- All studied varieties under research conditions provide the required conditions and the sugar content ranges from 15 to 20 g/100 cm^3

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