

**PHENOLOGICAL CHARACTERISTICS OF GRAPE VARIETIES OF *V. Vinifera* SPECIES, *Convar occidentalis* Negr. GROUP, IN THE ANNUAL CYCLE OF ONTOGENESIS****Petrov Valery Semenovich^{1*}****Dr. agricultural Science, Head. center "Viticulture and Wine-making"****S. V. Shcherbakov^{2**}, Cand. Agr. Sci.****A. G. Kovalenko^{2**}, Cand. Agr. Sci.****E. K. Kurdenkova^{2**}**¹Federal State Scientific Institution North-Caucasian Zonal Research Institute of Horticulture and Viti-culture, Krasnodar, Russia²Federal State Scientific Institution Anapa Zone Experimental Station of Viticulture and Wine-making, Anapa, Russia***E-mail: petrov_53@mail.ru; **azosviv@mail.ru****Abstract:**

A comparative study of perennial varieties of the species *V. vinifera* of the group *Convar occidentalis* Negr. (West European) in the annual cycle of ontogenesis of grapes on the collector area in homogeneous agro-ecological conditions of the South of Russia has shown that the timing of the beginning and duration of the phases of the growing season are closely dependent on the biological characteristics of the varieties and growing environment temperature conditions. The correlation of dependence between the duration of the growing season from bud break to the physiological ripening of grapes and an average daily air temperature during this period corresponds to the average and high levels of the most studied varieties. The closest correlation length of the growing season is installed on the amount of active air temperatures in the period from bud burst to the physiological ripening of grapes.

Key words: grapes, vegetation, correlation, variety, origin, amount of heat.**INTRODUCTION**

Regularities of the vegetation period and peculiarities of certain stages in the annual cycle of grape ontogenesis are of great practical importance when organizing a sustainable viticulture based on functional biodiversity. Varieties with different fruit ripening periods are used to form sort of a conveyor for consumption of fresh grapes and their industrial processing [1]. In agro-ecological zones of viticulture where early spring frosts occur from time to time the selection is aimed at developing and practical use of varieties with late budding to avoid buds damaging on young shoots by returning cold [2].

A grape plant has six stages of the vegetation period in the annual cycle of ontogenesis: sap flow, shoots and flower clusters growth, blooming, fruit growth, fruit ripening, shoots maturing and leaf drop [3].

Starting dates and duration of each stage of the vegetation period depend heavily on a number of various factors, including temperatures of grape growing conditions. Having analyzed a great number of grape varieties Lazarevskiy M.A. [4] showed the key role of heat for grape vegetation and its stages. High air temperatures reduce significantly the period of postembryonic development of flower organs

and bring nearer the date of grape blooming. In the opinion of Naumova L.G. and Novikova L.Yu. [5], the key climatic factor reducing the vegetation period from the beginning of blooming till complete ripening of fruit and from bud break till complete ripening of fruit is the air temperature above 20°C.

Biological peculiarities of varieties and their origins have a great impact on the vegetation.

The research objective was to study and identify vegetation peculiarities of West European (*Convar occidentalis* Negr.) varieties of *V. Vinifera* in the annual cycle of grape ontogenesis for their use in selection and production.

RESEARCH METHODS

The research was carried out on the basis of a grape collection field in the agro-ecological conditions of the Black Sea zone, central sub-zone, of viticulture of the Krasnodar Region (the Town of Anapa) in the years 2004-2013. We used the most common traditional varieties of the *V. Vinifera* grapes, of the *Convar occidentalis* Negr. (West European) group, used in production mostly for commercial purpose (wine-making), as research objects. We observed the processes of growth and

development of plants during their vegetation period using the methods of Lazarevskiy M.A., which are generally recognized and widely used in viticulture industry [6, 7].

RESULTS AND DISCUSSION

The Black Sea zone, central sub-zone, of viticulture of the Krasnodar Region is characterized by a mild climate. Duration of the vegetation period is up to 212 days. The sum of active air temperatures is 3200–3800°C. During the past 37 years the average annual temperature was 12.5°C, maximum being 38°C, and minimum being -24°C. Over time, we registered a sustained increase in maximum air temperatures and sustained decrease in minimum ones during that period. On average, the maximum temperature has increased from 33°C to 37°C in 1977–2014, and the minimum temperature has decreased from -12°C to -14°C. Annual precipitation was 452 mm, during the vegetation period – 220–320 mm.

In the climatic conditions of the South of Russia the duration of the vegetation period of the varieties under study varied greatly. On average, the range of variability of the number of days between the beginning of sap flow and complete physiological ripening of fruit among the *V. Vinifera* grape varieties of the *Convar occidentalis* Negr. group gave 38 days during the 8-year period of study. The minimum vegetation period was 138 days for the Madeleine–Angevine grape variety, the maximum one – 176 days for the Cabernet Franc grape variety.

The first stage of vegetation, sap flow, begins in the second and third ten-day periods of March. In the Black Sea zone the variety group

under study has it on March 17–25. The duration of this vegetative stage is 28–33 days, on average. The longest first stage of vegetation is registered for the varieties of Aligote and Sauvignon – 33 days, and the shortest – for the Cabernet Franc variety being 28 days. This vegetative stage ends the earliest with the beginning of the second one – bud break and shoots and flower clusters growth, at the varieties of Cabernet Franc, Cabernet–Sauvignon, Riesling Italian, and Madeleine–Angevine.

Duration of this stage depends on the variety and is 41–49 days. Blooming is synchronous in the first ten-day period of June. The range of variability of the dates of blooming in this variety group gave not more than three days, June 3–6. Fruit growth is most vigorous at the Madeleine–Angevine table grapes. This variety shows average duration of fruit growth of 41 days following the date of blooming, after which comes fruit ripening starting on July 14, as a rule. Wine grapes have the duration of fruit growth of 53–64 days, on average, and the ripening begins on 31.07–8.08.

Therefore, complete physiological ripening of fruit was registered earliest at the table grapes of Madeleine–Angevine on 2.08, on average. Wine grapes showed physiological ripening of fruit much later, on 19.08–15.09. In terms of the total number of days between the beginning of sap flow and complete physiological ripening of fruit, which increase progressively, the varieties can be ranged as follows: Madeleine–Angevine – 138 days, Merlot – 154, Portugieser – 154, Sauvignon – 160, Riesling Italian – 164, Cabernet–Sauvignon – 170, Aligote – 172, Cabernet Franc – 176 days (Table 1).

Table 1. Dates of vegetative stages of the *V. Vinifera* grape varieties, the *Convar occidentalis* Negr. (West European) group, the Town of Anapa, years 2004–2013

Variety	Beginning of sap flow	Beginning of bud break	Beginning of blooming	Beginning of fruit ripening	Complete physiological ripening of fruit	Number of days from the beginning of sap flow till complete physiological ripening of fruit
Madeleine–Angevine	17.03	15.04	3.06	14.07	2.08	138
Merlot	25.03	26.04	6.06	31.07	26.08	154
Portugieser	18.03	19.04	5.06	28.07	19.08	154
Sauvignon	20.03	22.04	5.06	1.08	27.08	160
Riesling Italian	22.03	21.04	4.06	5.08	2.09	164
Cabernet–Sauvignon	22.03	21.04	6.06	8.08	8.09	170
Aligote	19.03	21.04	4.06	7.08	7.09	172
Cabernet Franc	23.03	20.04	5.06	7.08	15.09	176



Taking into account the fact that peculiarities of vegetation were studied in similar climatic conditions on the uniform area of the ampelographic collection at one and the same time, we can make the conclusion that the number of days from the beginning of sap flow till complete physiological ripening of fruit varies depending on the biological peculiarities of the grape varieties under study. All other conditions being equal, it was the only distinctive feature during the field experiment.

When assessing the grape varieties we noticed certain variability of the number of days of the vegetation period in different years of the study.

During the research period the widest range of variability between the maximum and minimum values of the feature at certain grape varieties was

equal to the following: Cabernet Franc – 58 days, Merlot – 48, Aligote – 43, Cabernet–Sauvignon – 40, Madeleine–Angevine – 29, Portugieser – 29, Riesling – 25, Sauvignon – 17 days (Table 2).

Temperatures have significant impact on the variability of the duration of the vegetation period. Correlation dependence between the duration of the vegetation period from bud break till physiological ripening of fruit and average daily air temperatures during that period was medium and high for most varieties under study.

The closest correlation dependence of the duration of the vegetation period was registered for the sum of active air temperatures during the period from bud break till physiological ripening of fruit (Table 3).

Table 2. Number of days of the vegetation period of the *V. Vinifera* grape varieties, the *Convar occidentalis Negr.* (West European) group, from the beginning of sap flow till complete physiological ripening of fruit in different years of the study, the Town of Anapa

Variety	Year							
	2004	2007	2008	2009	2010	2011	2012	2013
Cabernet Franc	176	128	128	138	127	148	118	133
Merlot	-	105	105	153	122	144	112	-
Aligote	100	122	122	136	118	143	126	138
Cabernet–Sauvignon	169	136	136	135	132	142	129	132
Madeleine–Angevine	126	103	118	110	103	110	97	106
Portugieser	129	133	134	116	110	127	105	119
Riesling	135	143	143	133	135	135	118	123
Sauvignon	-	122	122	134	126	130	117	133

Table 3. Correlation dependence of the duration of the vegetation period of the *V. Vinifera* grape varieties, the *Convar occidentalis Negr.* (West European) group, and temperatures during the period from bud break till physiological ripening of fruit, the Town of Anapa, years 2004–2013

Variety	Correlation dependence between the duration of the vegetation period from bud break till physiological ripening of fruit and average daily air temperatures during that period	Correlation dependence between the duration of the vegetation period from bud break till physiological ripening of fruit and heat sum during that period
Madeleine–Angevine	0,08	-0,35
Merlot	-0,57	0,98
Portugieser	-0,31	0,71
Sauvignon	-0,42	0,70
Riesling Italian	-0,37	0,58
Cabernet–Sauvignon	-0,92	-0,08
Aligote	0,63	0,93
Cabernet Franc	-0,85	0,93

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