AGROBIOLOGICAL AND TECHNOLOGICAL CHARACTERISTICS OF THE BRESTOVITSA AND VARNA MAVRUD VARIETIES, GROWN ON EXPERIMENTAL FIELD OF TU-VARNA

Plamena YANKOVA, Magdalena KOLEVA
Technical University of Varna, Faculty of Manufacturing Engineering and Technologies, The Department of Plant Production, Studentska Street 1, 9010, Varna, Bulgaria
author e-mail: pl_yankova@abv.bg
author e-mail: magdalena.koleva@tu-varna.bg

Coressponding author: magdalena.koleva@tu-varna.bg

Abstract

An ampelographic study of the Brestovitsa and Varnenski Mavrud varieties was conducted. During the growing season, phenological observations were made, recording the timing of the main phenophases. A botanical description was made of young shoots, mature shoots, developed leaves, flowers, clusters, and berries. A mechanical analysis was performed to determine the structure and composition of the grape cluster. During the phase from the beginning of berry ripening to full (physiological) maturity, the dynamics of sugar accumulation in the grapes was monitored in order to determine the moment of consumptive and technological maturity. After the grape harvest, the average yield per vine was recorded and a physicochemical analysis of the grape must was performed. A sugar content of 19.1% and titratable acids of 6.74% were recorded. The Varnenski Mavrud variety was vinified, and a complete chemical analysis was performed on the wine obtained from the 2025 harvest. Classic technology for the production of dry red wines under microvinification conditions was used. The chemical composition of the grape must and the wine obtained was determined using the generally accepted methods used in winemaking. In addition, an analysis of climate data (temperature, precipitation, relative humidity) for 2025 was performed and compared with the average values for the previous 50-year period. During the growing season of 2025, air temperatures were within the climatic norm for the region. July (25.0 °C) and August (23.8 °C) were the warmest months of the year. The amount of precipitation is below and around the climatic norm for the region. The relative humidity values during the experimental year are within the norms.

Key words: Brestovitsa varieties, Varnenski Mavrud varieties, phenophases, physicochemical analysis

INTRODUCTION

Viticulture and winemaking are key sectors for the Bulgarian economy and cultural heritage, with the focus shifting in recent decades to the preservation and creation of new varieties adapted to the specific climatic and soil conditions of the country. Research in this area is essential for improving the quality of grape and wine production and increasing the competitiveness of Bulgarian wine on the world market.

With Bulgaria's accession to the European Union, the sector needs to produce high-quality and competitive products. To achieve these goals, farmers must use good production practices that ensure the production of high-quality agricultural products, and processors must use standard competitive production practices.

In recent decades, a significant number of new varieties (seeded and seedless) with different ripening periods have been created in Bulgaria through breeding

programms (Simeonov et al., 2009; Popov, 2017). The introduction of grapevine varieties for cultivation in a given area requires prior study of their agrobiological and technological qualities under specific agroclimatic conditions. Based on the information obtained, the most suitable ones for the respective area are selected (Stoev et al., 1964; Nakov et al., 2007). The technological qualities of grapes depend on the variety and the conditions of its cultivation. They are specific to each variety and vary greatly over the years and periods of development and ripening of the grapes. The technological characteristics of the variety are expressed through the mechanical composition of the grapes, the mechanical properties of the berries, and the chemical composition of the must. This points to the most appropriate use of the grapes and assessment of the production (Katerov et al., 1990). The determination of the technological qualities of different grapevine varieties grown in separate regions of Bulgaria has been studied by a number of authors (Babrikov and Roychev, 1995a; 1995b; Nikolova, 2011; Simeonov et al., 2012).

Grape yield is an extremely important agrobiological indicator for each variety. It reflects the genetic potential of the variety and the influence of all external factors – soil, climate, and cultivation technology (Katerov and Donchev, 1984; Donchev, 1991). As a result of decades of targeted selection of different varieties, a positive effect has been achieved in terms of fertility, yield, and grape quality (Schöffling and Stellmach, 1996).

In recent years, issues related to the quality of the production obtained from different grape varieties and the environmentally friendly origin of grapes and wine have become increasingly relevant both globally and in Bulgaria (Ivanov et al., 2016). The great importance of this problem is due to the vital need to protect the environment from chemical pollution with pesticides. Diseases and pests on vines have a negative impact on the quantity and quality of grape production.

The main agrotechnical measures for obtaining maximum yields and high-quality grapes from vineyards grown on flat and sloping terrain, studying the technological characteristics for obtaining high-quality table and sparkling wines, and, as a synthesis of everything, the economic assessment and profitability of viticulture in the northern Black Sea region and, on this basis, to develop a set of measures for comprehensive cultivation.

The aim of the study is to make a comparative analysis of the agrobiological (growth, yield, phenological phases) and technological (chemical and mechanical composition of grapes) indicators of the Brestovitsa and Varnenski Mavrud varieties grown in the conditions of the Eastern Black Sea wine-growing region. The results of this study will contribute to the further regionalization and promotion of Brestovitsa and Varnenski Mavrud as valuable Bulgarian varieties.

MATERIAL AND METHODS

The experimental work was carried out during the period 2024-2025. The vines on the experimental field of the Technical University – Varna were planted in the fall of 2011. The formations used are divided into three groups – low-stem, medium-stem, and high-stem. They are divided into two groups in terms of varieties – dessert and wine. The study includes the varieties Brestovitsa and Varneski Mavrud, on which phenological observations were made.

All studies related to the determination of morphological characteristics, agrobiological properties, and technological qualities were conducted during the period 2025 according to the accepted methodology for ampelographic studies in Bulgarian Ampelography (1990). It includes the following indicators:

- Botanical description - crown, young shoot, mature shoot, developed leaf, flower, bunch, berry, seed;
- Agrobiological characteristics - Phenological observations - budding, flowering, ripening, technological maturity; Actual fertility - number of bunches, average yield per vine, kg;
- Mechanical analysis of bunches and berries - weight of bunches, berries, and stems.
- Physical and chemical analysis of wine - 1. Alcohol, vol. % - BDS (pycnometric method); 2. Sugars, g/dm^3 - BDS (Shoorl method); 3. Titratable acids, g/dm^3 - BDS (titrimetric method); 4. Volatile acids, g/dm^3 – BDS (titrimetric method); Sulfur dioxide (total and free) – BDS; 15. Wine tasting evaluation

Characteristics of the varieties

Brestovitsa variety

The Brestovitsa variety was created at the Institute of Viticulture and Enology in Pleven (Figure 1). Its name was given by chance after planting material was purchased to create a plantation of the Super Ran Bulgar variety in the village of Brestovitsa (Plovdiv). Until then, the variety had not been established and was registered only under a breeding number. It's very good development in the area of the village of Brestovitsa gave the authors reason to name it Brestovitsa.

The Brestovitsa variety was obtained by Y. Ivanov, V. Valchev, K. Stoev, and Z. Zankov in 1966 by crossing the Italia and Yantar varieties. It was approved by the IASAS in 1983 (Order No. I-145/24.01.1983).

Bunch – medium-sized (16.4/10.1 cm), conical, often winged with one wing, semi-compact to loose. Average bunch weight – 317 g.

Berries – very large (27.4/19.6 mm), cylindrical in shape, pointed at the base, rounded at the tip. The skin is thick, elastic, yellow-green to amber-yellow, with a thick waxy coating. The flesh is juicy, with a harmonious taste and a slight muscat aroma.

Average berry weight – 7-10 g. Individual berries reach up to 15 g.

Brestovitsa is a large-fruited, early-ripening dessert variety. The grapes ripen in the second half of August. The variety is vigorous, with good fertility and yield. The percentage of fruit-bearing shoots varies from 65.37 to 76.0, and the fertility coefficient is 1.12. The yield per vine is 6.778 kg, and per hectare - 12,000 - 20,000 kg.

The Brestovica variety is prone to thinning and mildew. The vines have low resistance to low winter temperatures. They are highly susceptible to powdery mildew. The grapes have good resistance to cracking and gray mold.

In order to obtain high-quality yields, it must be grown on richer and deeper soils, using the Guyot training system.

The grapes have very good transportability and storability. After ripening, they remain fresh on the vines for a long time.

Figure 1. Brestovitsa variety

Variety Mavrud Varnenski

Mavrud Varnenski is a late-ripening red wine variety (Figure 2). It belongs to the Black Sea ecological-geographical group. The petiole is medium-sized, longer than it is wide, slightly incised, five-lobed, and very hairy. The bunch is medium-sized, cylindrical, conical, and compact. The berries are slightly oval, small or medium-sized. The variety has high fertility and yield. It is sensitive to downy mildew and powdery mildew. The vines have medium growth and the shoots ripen well. The variety is sensitive to low winter temperatures. The grapes do not accumulate enough sugar. It is suitable for producing dry wines.

Figure 2.Mavrud Varnenski variety

RESULTS AND DISCUSSION

Bulgaria's agroclimatic resources are determined by its geographical location, relief, and the influence of the nearby seas - the Mediterranean and the Black Sea (Ahmed, 2004).

The agroclimatic characteristics are based on data on the daily course of meteorological factors (air temperature, rainfall, and relative humidity) monitored by the automatic weather station at the Experimental Field of the Department of Plant Production, Technical iniversity – Varna, and compared with the synoptic station at NIMH – Varna.

Of the climatic factors, temperature, rainfall, and relative humidity are important for the growth and development of vines.

During the growing season of 2025, air temperatures were within the climatic norm for the region. July (25.0 °C) and August (23.8 °C) were the warmest months of the year. Against the backdrop of the climatic norm, there was a slight upward trend in temperatures, but this did not have a negative impact on crop development during the study years (Figure 3).

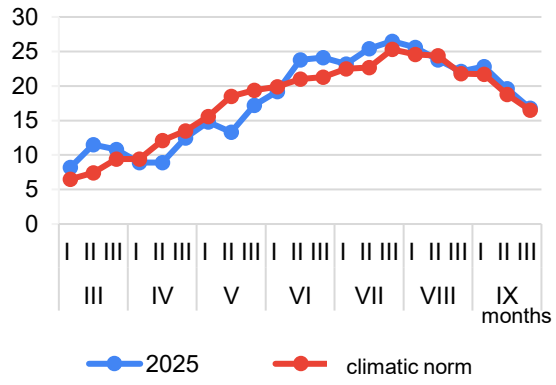

Figure 3. Air temperature

The entire growing season is characterized by rainfall in April (43 mm) and May (61 mm). A period of drought is observed in June (3.5 mm), July (12 mm), and August (11.5 mm). The amount of rainfall is below and around the climatic norm for the region (Figure 4).

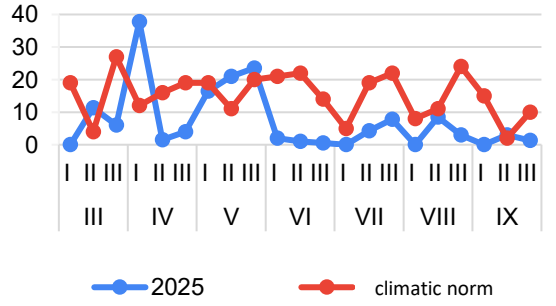

Figure 4. Rainfall

The relative humidity values during the experimental year were within normal limits. It should be noted that during the growing season, no values of this climatic factor below 50% were recorded, which would have hindered the processes of flowering, pollination, and fruit formation. At the same time, no relative air humidity above 80% was recorded, which would suppress plant development and create conditions for the emergence of various diseases (Figure 5). The relative humidity for the analyzed period is below the specified climatic norm for the region.

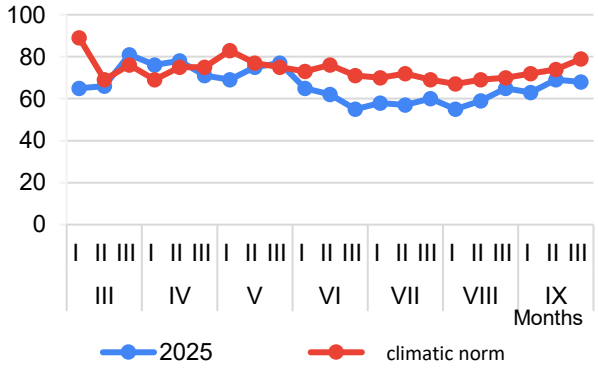

Figure 5. Relative humidity of the air

During the growing season, phenological observations were made on the studied dessert and wine grape varieties (*Vitis vinifera* L.) at the Experimental Field of the Technical University – Varna in order to determine the start dates of the key phenophases (Table 1). During the study year (2025), the bud break phenophase for the Brestovitsa variety ended on 01.04, and for the Varna Mavrud variety on 31.03.2025. Flowering lasted until April 1 for Brestovitsa and until May 12 for Varnenski Misket. The phenophase of ripening for the Brestovitsa variety began on August 15 and ended with physiological (consumable) ripeness on September 26, 2025. For the Varna Mavrud variety, the beginning of the phenophase was recorded on 07.08, and technological maturity occurred on 08.10. Analysis of the results of the phenological observations shows that there is no significant difference in the timing of the individual phenophases. They are within the ranges characteristic of the studied varieties.

Table 1. Phenological observations in 2025

Variety	Sap flow	Flowering	Start of ripening	Physiological maturity	Leaf fall
Brestovitsa	1.IV	1.VI	15.VIII	26.IX	5.XI
Varnenski Mavrud	31.III	12.V	7.VIII	8.X	5.XI

The data from the mechanical analysis of bunches and berries for 2025 are presented in Table 2. The average weight of a bunch of the Brestovitsa variety is 332.6 g, and that of the Mavrud Varnenski variety is 180.2 g.

The weight of the berries of the Brezovica variety ranges from 294.0 g to 302.7 g. For the wine variety, the weight of the berries varies from 168.1 g to 193.3 g.

The weight of the bunch ranges from 5.0 g to 10.3 g for the dessert variety Brestovitsa and from 5.9 g to 7.0 g for the wine variety Mavrud Varnenski.

The number of berries in the individual varieties ranges from 48 for the Brestovitsa variety to 118 for the Mavrud Varnenski variety.

The results obtained from the analyses wine show that the grapes manage to ripen under the soil and climatic conditions of the Experimental Field of the Technical University of Varna (Table 3).

Replication	Mass of a cluster, g	Grain weight, g	Mass of the hook, g	Number of grains
Brestovitsa variety				
1	299,4	294,0	5,4	53
2	385,4	380,0	5,0	48
3	313,0	302,7	10,3	60
average	332,6	325,6	6,9	53,66
Mavrud Varnenski				
1	179,2	173,3	5,9	72
2	168,1	161,1	7,0	99
3	193,3	187,3	5,9	118
average	180,2	173,9	6,3	96,3

Table 2. Mechanical analysis for 2025

Table 3. Chemical analysis of wine

Indicator	Value
Alcohol	13,19 об.%
Relative weight	0,991
Total extract	21,7 g/dm^3
Sugar	1,0 g/dm^3
Titratable acids	5,43 g/dm^3
Volatile acids	0,30 g/dm^3
Free SO_2	21,7

The grapes reached technological maturity in early September with a very good sugar-acid ratio. The alcohol content is higher due to the addition of sugar before fermentation. The titratable acids are slightly higher, but this is typical for the variety and for young wines. The resulting wine is characterized by good density and freshness. A tasting and evaluation on a 100-point scale will be carried out.

CONCLUSIONS

During the growing season of 2025, air temperatures in the area of the Training and Experimental Field of TU-Varna were within the climatic norm. July (25.0°C) and August (23.8°C) were the warmest months of the year.

Rainfall was below and around the climatic norm. Relative air humidity values were within the normal range, with no values below 50% (which would hinder flowering and fruit formation) or above 80% (which would create conditions conducive to disease).

An analysis of the results of the phenological observations leads to the conclusion that there is no significant difference in the start dates of the individual phenophases during the study period.

The Brestovitsa and Varnenski Mavrud varieties studied are characterized by a relatively good yield per vine, with good agrobiological and technological qualities.

The results obtained from the analyses of Varnenski Mavrud wine show that its grapes are able to ripen under the soil and climatic conditions of the Training and Experimental Field of the Technical University of Varna.

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