

Concise economic description of the basic local grapevine varieties for the Republic of Bulgaria*

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Abstract. Data of long years of research on agrobiological and technological characteristics of some of the basic and most common for Bulgaria local vine varieties are presented in the study. The economic characteristics of three white and four red local wine-yielding vine varieties are described. It was found that these varieties are distinguished by very high actual fertility and productivity, relatively constant across the years. According to the mechanical analysis of the studied vine varieties, they were typically wine-yielding, with specific characteristics of cluster and berry, suitable for the production of quality red and white wines and different wine-based products. These varieties have excellent adaptive potential for the soil and climatic conditions in the Republic of Bulgaria and are suitable to be cultivated in the typical for each of them vine-growing regions of the country.

Key words: economic characteristics, local varieties, vine

Introduction

Vine is the most widely grown crop in the world due to its ecological plasticity and high quality fruits (Alleweldt & Possingham 1988). For thousands of years man has purposefully selected plants that had provided him with food for his subsistence. Thus thousands of forms and varieties distinguished by their morphological characteristics or economic features had been selected (Arroyo-Garcia & al. 2006).

Grapes-growing and wine-making in Bulgarian lands is traced down back to Antiquity. The study of species and varieties had started then and was directly related to the development of human culture and knowledge of vine-growing and processing of grapes. Already the ancient Thracians had a good idea of the variety diversity and had raised Pamid, Mavrud, Muscat Red, Gamza, Shiroka Melnishka Loza, Dimiat, etc., as evidenced by the found grape seeds in the un-

earthed clay wine vessels – cisterns, pots, cult devices for wine-making, etc. (Dukov 1965; Georgiev 1966; Nachev 1981). At that time, diversity in the primitive forms of wild vines was obtained as a result of free hybridization, carrying the seeds of cultivars by birds and mammals in natural conditions and selective breeding. According to Negrul (1968), there were two actual ways for the origin of local varieties: vine selection within an area and transferring seeds of androgynous varieties from other areas, and natural hybridization with local wild forms and selection.

On the basis of a comprehensive analysis of the globally widely distributed cultivars and forms of wild vines, Negrul (1946a, 1968) created the so far most complete contemporary ecogeographic classification. It was built on the confirmation of the monophyletic theory that different varieties in the different regions had originated from different forms of the same species of wild vine, as a result of centuries

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of selective breeding. This process had led to formation of the groups of varieties with common morphological characteristics and biological features. The analysis of the main morphological characteristics, biological features and technological properties of indigenous and cultural varieties in ancient viticultural areas has allowed to establish regularities in their geographic distribution. On this basis, Negrul (1946b) identified three main ecogeographic groups: *Proles orientalis* (Eastern), *Proles occidentalis* (Western) and *Proles pontica* (Black Sea). The varieties of *Proles pontica* originated from the local wild vine *Vitis vinifera* ssp. *silvestris* var. *balcanica* Negr. distributed about the VI–V millennium B.C. around the Black Sea: in the Caucasus, Asia Minor and the Balkan Peninsula. According to its geographic origin, the group was divided into two subgroups: *subconvarietas georgica* Negr. – Georgian, and *subconvarietas balcanica* Negr. – Balkan. The cultivars of *subconvarietas balcanica* were typical varieties of wild vine found only on the Balkan Peninsula. The most famous local varieties in Bulgaria – Mavrud, Gamza, Shiroka Melnishka Loza, Pamid, Shevka, Muscat Red, Dimiat, etc. – were typical representatives of this subgroup (Roychev 2012).

As a result of mankind's development, selection of vine cultivars from their natural habitats and their multiplication and distribution, nowadays a large number of varieties are grown with a basic set specific to each country. This is the best stored own vine assortment of Germany (79.2%) and Turkey (77.9%), followed by Spain (64.8%), Hungary (60.5%), Russian Federation (57.1%), Greece (50.3%), France (44.9%), Italy (36.7%), and USA (28.7%) (Roychev 2012: 11). The local varieties, along with the resulting intraspecific and interspecific crosses, constitute almost 93% of all known vine varieties (Alleweldt & Dettweiler-Munch 1992; Steuerer & al. 1997; Nosulchak & Troshin 1998). In Bulgaria, under the influence of a number of political, climatic, anthropogenic, and structural trends and changes, a reduction of the areas and loss of interest in growing vineyards planted with old local varieties was more noticeably observed. In the last 10–15 years, there have been certain changes in the structure of the cultivated wine-yielding grapevine varieties. Eligibility for European pre-accession and structural and thematic funds, on the one hand, and desire of the wineries in Bulgaria to change and diversify their production in style, organoleptic characteristics and competitiveness, on the other, have resulted in establishing of many vineyards planted with introduced vine varieties

and clones. All these causal links lead to a great danger, namely the inclusion of these local vine varieties in the paragraph: “threatened by genetic erosion”.

The objective of this study is to present in brief the economic characteristics of the main and widest distributed in Bulgaria old local grapevine varieties.

Material and methods

An ampelographic study of the varieties was carried out in the ampelographic collection and breeding sections of the Experimental Station of the Institute of Viticulture and Enology in Pleven. The trial plantations were located to the west of Pleven town, in the area along the right bank of river Vit. The average altitude is 250 m. The climate in this region is pronouncedly continental. The soils are slightly leached chernozem, formed on loam.

An ampelographic study of the presented local Bulgarian vine varieties was carried out during various periods in the 20th and 21st century, in terms of recording the indicators characterizing the actual fertility, yield qualitative and quantitative parameters and mechanical and chemical properties of grapes in accordance with the methodology described in volume 1 of *Bulgarian Ampelography* (Katerov 1990). The general methods in enology were applied in determining the chemical composition of must and produced wines (Ivanov & al. 1979). The organoleptic qualities of wines from the studied local varieties were assessed by tasting committees at IVE-Pleven on a 100-score tasting scale (Tsvetanov 2001).

Results and discussion

White wine vine varieties

Muscat Red (Fig. 1)

Muscat Red is an old local variety. It is mainly cultivated in the eastern and southern vine-growing regions. Larger plantations exist in Sungurlare Valley, Karlovo and Vratsa regions.

Botanic description

Cluster. The cluster is medium-sized (13.7/8.9 cm), cylindrical-conical, occasionally with one or two wings, semicompact to compact. The average mass per cluster is 150.0–170.0 g.



Fig. 1. *Muscat Red*.

Berry. The berry is medium large (13.4/12.7 mm), almost spherical. The skin is medium thick, supple, light-pink to purple, covered with large, dark-brown, closely spaced dots (typical). The texture is juicy with harmonious, tender and pleasant Muscat flavor. The average weight per 100 berries varies from 190.0 g to 290.0 g.

Agrobiological characteristics. Muscat Red is a late-ripening red wine grapevine variety. Grapes ripen in the second half of September. The vegetation period from budding to technological maturity of grapes is about 170 days. Vines are distinguished for their vigorous growth, high fertility and yield. The fertility rate per developed shoot is 1.35 to 1.60, while a fruit shoot reaches 1.92. The average yield per vine raised under the Guyot training system is 3.200 kg. Due to its high fertility, it is recommended that short fruiting parts – spurs and, whenever necessary, arrows to be left.

Technological characteristics. In its mechanical composition, the grapes of Muscat Red variety are typically wine-yielding. The berry ratio is 97.41 %, while of the rachis is 2.59 %. The skins in the berry structure claim 8.91 %, the seeds 3.41 % and the mesocarp 87.68 %. The grapes accumulate enough sugars – mostly from 18.0 % to 20.0 %, while keeping satisfactory titratable acidity of 5.4–6.1 g/dm³. The grapes are suitable for the production of quality dry white wines. The wines are characterized by pale straw-yellow colour with greenish hues, a pronounced fine, delicate and balanced Muscat aroma and touches of field flowers. The taste is elegant, harmonious, with a good fresh finish and long aftertaste.

Dimiat (Fig. 2)

The Dimiat variety was probably brought from Egypt to Thrace along the shores of the Black Sea by Greeks and had been cultivated since ancient times in the Bulgarian lands. Most plantations are mainly located in Varna and Burgas regions, but it is grown on small areas in Mt Sredna Gora and part of Stara Zagora district.

Botanic description

Cluster. The cluster is medium to large (20.0/16.0 cm), conical, often winged, semicompact to loose, occasionally with uneven-sized berries. The average mass per cluster is 250.0–400.0 g.

Berry. The berry is medium large to large (19.4/16.9 mm), oval, well stuck to the stalk. The skin is yellow-green with a nice pearly hue, occasionally parched, thin and fragile, with weak to medium dense wax coating. The mesocarp texture is slightly thick, juicy. The taste is harmonious when the berry is well ripe, with a slight vanilla nuance. The average weight per 100 berries is 310.0–400.0 g.

Agrobiological characteristics. Dimiat is a late-ripening white wine grapevine variety. In the Plevnen region its grapes ripen in the beginning of October. The duration of the period from budding to technological maturity is about 170–180 days. Vines are moderately to vigorously growing. The variety is characterized by very high fertility. The fruit shoots ratio varies from 75 % to 95 %, and the fertility rate from 1.60 to 1.70. The yield per vine, depending on the different training systems, varies from 2.4 kg



Fig. 2. *Dimiat*.

with lyre to 5.3 kg with ground Guyot, and per decare amounts to more than 2000 kg. The variety is not liable to putting forth catkins and millerandage, which occur as an exception in unfavorable years with frequent rains during blossoming. It is not resistant to powdery mildew and crown gall. The variety is highly susceptible to low winter temperatures and, therefore, its stem cultivation is possible only in areas where the temperature in this season does not fall below -16°C , and autumn is dry and long. The regenerative capacity of the variety after frost is very good.

Technological characteristics. According to the mechanical composition of the cluster, Dimiat is a typical variety for double use: for wine and for fresh consumption. The berries ratio in the cluster is 97.70 %, while of the rachis – 2.30 %. The skins are 6.40 %, the seeds 2.10 % and the mesocarp 91.50 % of the berry texture. The theoretical yield of must is 89.40 %. The grapes are mainly used for production of quality dry white wines, wine distillates and natural sparkling wines. The dry white wines are characterized by pleasant straw-yellow colour with a light-greenish hue, fresh and harmonious taste and subtle aroma and are suitable for maturation and aging. Grapes with less sugars and higher acidity are used for making quality wine-based distillate products.

Muscat Vrachanski (Fig. 3)

Muscat Vrachanski is a local variety for Bulgaria, belonging to the Eastern Ecogeographic Group. It is grown on limited areas in the regions of Vidin, Vratsa, Montana, Lom, Burgas, etc.

Botanic description

Cluster. The cluster is medium-sized (12.2/9.2 cm), conical, with a wing, semicompact. The average mass per cluster is 120.0–140.0 g.

Berry. The berry is medium large (16.8/15.4 mm), oval. The skin is yellow-green on top, with a clear hub as a flat prickle and rusty spots on the sunlit side, thick and tough. The mesocarp texture is thick and juicy. The taste is harmonious, with a strong Muscat flavor. The average weight per 100 berries is 220.0–240.0 g.

Agrobiological characteristics. Muscat Vrachanski is a late-ripening white wine grapevine variety. Grapes ripen in the second half of September. The duration of the period from budding to technologi-

cal maturity is about 160 days. Vines are moderately growing and shoots can mature well by the end of the vegetation season. The variety is characterized by medium fertility and yield. The fruit shoots ratio is 80.00 % to 87.00 %, and the fertility rate is 1.50. The yield per vine, when grown on high-stem Mosser training with applied mixed pruning system, is about 3.5 kg and per decare is 800–1000 kg. Muscat Vrachanski is not liable to putting forth catkins and millerandage. It is not resistant to downy mildew, powdery mildew and crown gall. Its grapes are practically resistant to grey mould. It is susceptible to low winter temperatures and, therefore, its stem cultivation is efficient only in warm areas, where temperatures in winter do not fall below -16°C .

Technological characteristics. Muscat Vrachanski is a typical wine-yielding grapevine variety. The berries ratio in the cluster is 97.55 %, while of the rachis – 2.45 %. The skins in the berry texture are 6.99 %, the seeds 2.67 % and the mesocarp 90.34 %. The grapes contain enough sugars – 21–24 %, and a relatively low amount of titratable acids – from 4.6 to 5.8 g/dm³. The theoretical yield of must is 88.13 %. The variety can produce dry, semidry and semisweet wines, and only in some years quality liqueur wines. They are straw-yellow in color, with a light greenish hue that aging changes to golden, but they are not sufficiently fresh and extractive. The Muscat flavor is specific and strong. It is retained during wine aging and is actively involved in the formation of a rich and well expressed bouquet.



Fig. 3. *Muscat Vrachanski*.

Red wine vine varieties

Mavrud (Fig. 4)

Mavrud is an old local variety, raised in Bulgarian lands since ancient times, mainly in certain microregions of the Southern Vine-Growing Region.

Botanic description

Cluster. The cluster is medium-sized (15.6/10.1 cm), cone-shaped with wings, semicompact to compact. The average mass per cluster is 210.0–400.0 g.

Berry. The berry is medium large to small (12.8/12.3 mm.), spherical. The skin is medium thick, supple, dark-blue, with abundant wax coating. The texture is juicy and the taste is pleasantly sweet. The average weight per 100 berries is 150.0–170.0 g.

Agrobiological characteristics. Mavrud is a late-ripening red wine variety. The grapes ripen in early October. The period from budding to physiological ripeness of the grapes is about 170–180 days. The vines are characterized by average growth, average fertility and yield, varying across the years. The variety is not liable to putting forth catkins and millerandage. It is susceptible to downy mildew and powdery mildew. Its grapes are practically resistant to grey mould. The vines have poor resistance to low winter temperatures and, therefore, they should be raised on a ground hilled-up single or double Guyot training system or in areas where the temperatures in winter do not fall below -16°C . Mavrud variety has no good affinity to the common rootstocks used in the country and in the place above the graft brooks

are formed. The highest rate of premium vine planting material with very good graft and well developed root system is obtained when the cuttings are grafted to MK 4 rootstock.

Technological characteristics. According to its grapes mechanical composition, Mavrud is a typical wine-yielding variety, with a high rate of skins and seeds, which is a prerequisite for obtaining rich in phenolic substances and extractive wines. The berry ratio in the cluster is 96.25 %, and of the rachis 3.75 %. The skins in the berry texture are 9.0 %, the seeds 4.44 % and the mesocarp 86.56 %. The theoretical yield of must is also high – 83.31 %. The sugars content of the grapes varies considerably per vintage: from 17.0 % to 22.0 %. Titratable acidity is high: from 6.1 g/dm³ to 10.7 g/dm³. The grapes of Mavrud variety are suitable for production of quality dry red wines. It is one of the most valuable local red wine varieties. The wines are intensely (from dark-red to garnet) coloured, with moderately high acidity, extractive and with optimal content of phenolic substances, harmonious. The wine develops fully its qualities after aging in oak barrels.

Gamza (Fig. 5)

Gamza variety is an old local variety cultivated mainly in the Northern Vine-Growing Region.

Botanic description

Cluster. The cluster bunch is medium-sized (14.0/8.6 cm), cylindrical-conical, usually with a wing, compact. The average weight per cluster is 140.0–180.0 g.



Fig. 4. *Mavrud*.



Fig. 5. *Gamza*.

Berry. The berry is medium large (13.3/13.1 mm), almost spherical, deformed in the compact clusters. The skin is thin, fragile, dark-blue, with abundant wax coating. The texture is succulent, the taste – harmonious. The average weight per 100 berries is 230.0–270.0 g.

Agrobiological characteristics. Gamza is a late-ripening red wine variety. The grapes ripen at the end of September, early October. The duration of the vegetation period from budding to technological maturity of the grapes is about 170 days. The vines are characterized by an average to vigorous growth, high fertility and yield. The fertility ratio per developed shoot varies from 1.08 to 1.65, while of a fruit shoot – from 1.82 to 1.97. The average yield per vine under Guyot training system is 3.660 kg. The variety is not liable to putting forth catkins and millerandage. It is susceptible to the fungal diseases downy mildew and powdery mildew and highly susceptible to grey mould, especially in years with rainy autumns. It is not resistant to low winter temperatures but has good regenerative capacity. Due to its low cold resistance, it is recommended that the variety should be grown on ground training systems – lyre and single Guyot. In areas without extremely low winter temperatures it could be raised on stem training, with short fruit-bearing units – at spurs.

Technological characteristics. According to its grapes mechanical composition, Gamza is a typical wine variety. The berry ratio in the cluster is 96.00 %, the rachis 4.00 %. The skins in the berry texture are 6.90 %, the seeds 3.40 %, while the mesocarp is 89.70 %. The theoretical yield of must is 86.11 %. Gamza variety is characterized by a moderate rate of sugar accumulation. The sugars content at grapes technological maturity varies within the range of 19.0 % to 21.0 %, while the titratable acidity – from 6.4 to 8.4 g/dm³. From well ripe and healthy grapes, Gamza wines are produced with bright-red ruby color, subtle fruity aroma dominated by raspberry and typical resin, and harmonious and soft taste with pleasant freshness. According to the content of total phenolic compounds, anthocyanins and color intensity, it is referred to the “lighter” type of red wines. The wines are suitable for consumption as young, while in a short period of aging they quickly develop their qualities.

Pamid (Fig. 6)

Pamid is a very old local variety, typical of the Black Sea Ecogeographic Group. It is believed that already the ancient Thracians had grown it in these areas. In the past, it was the most common variety in Bulgaria. In the South Bulgarian Vine-Growing Region, it occupies the first place among the wine grapevine varieties and in the North Bulgarian it comes second after the Gamza variety.

Botanic description

Cluster. The cluster is medium-sized (16.4/10.1 cm), cylindrical-conical, semi-compact to loose. The average mass per cluster is 190.0 g, ranging from 160.0 g to 220.0 g.

Berry. The berry is medium large (15.6/14.4 mm), rounded down, slightly stuck to the stalk. The skin is red, dark-red in some variations, thin, fragile, with wax coating. The mesocarp texture is juicy and crispy. The taste is sweet, harmonious and neutral. The average weight per 100 berries is 240.0 g (from 190.0 g to 290.0 g).

Agrobiological characteristics. Pamid is a late-ripening red wine variety. Its grapes ripen in the second half of September. The duration of the period from budding to technological maturity is about 160 days. The vines are characterized by vigorous growth and straight growing shoots. Its fertility is very good. The fruit shoots ratio varies from 68.00 % to 88.00 % (78.00 %), while the fertility ratio is 1.26. Two clusters are usually set per one fruit shoot. The yield per vine under stem Moser training system with spur pruning is about 4 kg, while per decare it usually varies from 1000.0 kg to 1500.0 kg. Putting forth catkins and mil-



Fig. 6. Pamid.

lerandage in Pamid variety occurs, when during flowering the air is too warm and dry, or there are frequent rains and periods of cool weather. It is not resistant to downy and powdery mildew and pests. Grapes are seldom attacked by grey mould. It is moderately tolerant to low winter temperatures.

Technological characteristics. Pamid is a typical wine variety but its grapes are used for fresh consumption too. The berry ratio in the cluster is 97.45%, of the rachis – 2.55%. The skins in the berry texture are 6.38%, the seeds 2.55%, while the mesocarp is 91.07%. Its sugar content varies from 17.9% to 24.2%, however, the titratable acids are less – 4.4–5.5 g/dm³. The theoretical yield of must is 88.75%. Mainly light-red and rosé dry wines are made from it. They have low acidity and low extract and, therefore, are not suitable for aging. The dye substance and quality of Pamid wine may be enhanced by adding before fermentation 5–10% of grapes of some coloring varieties, or by coupage of finished wines.

Shiroka Melnishka Loza (Fig. 7)

Shiroka Melnishka Loza is an old local variety grown since ancient times in the Melnik microregion, from where its name comes.

Botanic description

Cluster. The cluster is medium to large (15.2/9.1 cm), conical, often with more than two wings (crossed), semi-compact to compact. The average mass per cluster is 200–300 g.



Fig. 7. *Shiroka Melnishka Loza*.

Berry. The berry is medium large (13.7/12.4 mm), oval. The skin is thick, tough, blue-black, with abundant wax coating and colorless juice. The texture is juicy and the taste harmonious. The average weight per 100 berries is 200.0–270.0 g.

Agrobiological characteristics. Shiroka Melnishka Loza is a late-ripening red wine variety. Its grapes ripen in the first half of October. It exhibits best its valuable qualities only in the Melnik microregion, where the active temperature during the vegetation period from budding to technological maturity amounts to over 40 °C. The vines are characterized by vigorous growth, good fertility and yield. The fertility ratio is 1.2–1.4. The average yield per decare under Moser training system reaches to 2000 kg/dka. Shiroka Melnishka Loza variety is not liable to putting forth catkins and millerandage. It is susceptible to downy mildew, powdery mildew and low winter temperatures. Grapes are relatively resistant to grey mould.

Technological characteristics. In its mechanical composition, Shiroka Melnishka Loza is a typical wine variety. The berry ratio in the cluster is 97.6%, of the rachis – 2.4%. The skins in the berry texture are 7.55%, the seeds 3.82%, while the mesocarp is 88.63%. The theoretical yield of must is 86.51%. Under the climatic conditions of Melnik region, grapes reach technological maturity in early October as the sugars content ranges within 22.0–24.0%, and titratable acidity is 6.0–8.0 g/dm³. The grapes are suitable for the production of quality dry red and dessert wines. The wines from this variety are rich in extracts and phenolic substances, with a specific dark-red colour, harmonious taste and excellent bouquet after aging.

Conclusion

In the conditions of increasing globalization and overproduction of grapes and wine in the world, there have been higher demands for the grapes quality and the products made from it. Under the growing competition in international markets, Bulgaria should keep its place rediscovering the qualities of traditional local wine varieties. Under such conditions, the combination of nature and the potential of varieties are a prerequisite for the production of wines of unique individual character, with which Bulgaria could achieve sustainable presence in the global wine market.

The described local varieties are distinguished by very high actual fertility and productivity, relatively constant across the years. According to the mechanical analysis of the studied vine varieties, they are typical wine-yielding varieties, with specific characteristics of cluster and berry, suitable for the production of quality white and red wines and different wine-based products. These varieties have excellent adaptive potential to the soil and climatic conditions in the Republic of Bulgaria and are suitable for cultivation in the vine-growing regions and micro regions of Bulgaria, typical for each of them.

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