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## PRELIMINARY DATA ON MORPHOLOGICAL, GENETIC AND ENOLOGICAL DIVERSITY OF NEGLECTED AUTOCHTHONOUS GRAPE VARIETES OF ARMENIA

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In this study the neglected and endangered local grape varieties were rediscovered in native areas of their cultivation. The genetic, morphological and enological diversity were characterized. These results are giving a good perspective for endangered autochthonous grapevine cultivars preservation and future use.

*Grape – autochthonous – preservation – diversity*

Այս աշխատանքում իրենց բնական աճելավայրերում հայտնաբերվել և նկարագրվել են խաղողի անտեսված և մոռացված մի շարք աուտոխտոն սորտեր: Ուսումնասիրվել է դրանց գենետիկական, ձևաբանական և էնոլոգիական բազմազանությունը: Ստացված արդյունքները կարևոր են և՛ հեռանկարային խաղողի աուտոխտոն վտանգված սորտերի պահպանության և՛ դրանց հետագա օգտագործման համար:

*խաղող – աուտոխտոն – պահպանություն – բազմազանություն*

В данном исследовании были описаны забытые и исчезающие местные сорта винограда в местах их естественной культивации. Описанно их генетическое, морфологическое и энологическое разнообразие. Полученные результаты имеют важное значение для сохранения находящихся под угрозой исчезновения местных сортов винограда и их использования в будущем.

*Виноград - аутохтонный – сохранение – разнообразие*

Armenia is one of the ancient cradles of viticulture and wine-making, with a rich diversity of local varieties. Despite the economic significance and the possibility of obtaining the very unique wines, many of these varieties are on the verge of extinction.

Current situation in the wine market, globalization and standardization of production technologies gradually lead to reduction in the number of varieties worldwide, resulting in the contraction of wine range.

Native grape varieties are of cultural, financial, social and environmental significance. The study and evaluation of properties of local wine grape varieties tell that we may increase the volume of indigenous varieties together with the production of different types of wine and beverages with unique properties that can be valuable on the international markets. Due to this effort, many forgotten wines with unique bouquets can become competitive again and regain the attention of the consumers [4]. They may represent the culture of the country and the certain areas of it just as historical monuments do.

The aim of the present study is the detection, identification and recovery of Armenian autochthonous neglected and endangered grape varieties, via eco geographical survey, followed by the identified varieties ampelographic, genetic and enological characterization.

**Materials and methods.** *Literature survey:* The research started by thorough literature survey and available databases, as well as with interviews with oenologists and grapevine professionals, in order to choose locations of vineyards in the region on the possible occurrence of varieties, considering the age of vineyard as a limiting factor.

*Field identification and ampelographic description:* The sites of each grapevine discovery were marked by GPS and mapped. Standard methods were used for the ampelographical characterization as required by The International Organization of Vine and Wine (OIV) descriptors [7]. A total of 24 descriptors were included.

*Molecular characterization:* The genetic analyses were implemented at Center of Excellence in Applied Biosciences, Yerevan State University, (Yerevan, Armenia). Genomic DNA was isolated according to the protocol for DNeasy Plant Mini Kit (Qiagen, Hilden, Germany). 23 polymorphic microsatellites considered as the most appropriate to evaluate the grapevines (European project GENRES081, <http://www.genres.de/vitis>) were used.

*Enological characterization:* grape of each single cultivar was winemaking processed following standardized steps for red and white wine production. Besides routine chemical tests, that accompany the various phases of the working process, detailed analyses of the composition of finished wines was carried out, including phenolic and aromatic compounds [5,8]. Sensory evaluation of wines was performed according to the Consumer Test. For each sample were evaluated colour, odour and taste. For each parameter a nine point hedonistic scale was used.

**Results and Discussion.** The 12 varieties were identified and investigated as follows Arevik, Tchilar, Qrdi Tchakat, Mormor, Movuz, Movses, Mskhali, Tozot, Garan Dmak, Xhatun Xhargi, Bananc, Lalvari. During field studies 5 unknown grape varieties have been found, which are not described in any ampelography, within the local communities these are known as: Bui Achq, Mer u Bala, Unknown, Spitak Khagog, and were labeled, positioned by GPS and require detailed study.

Multi-crop passport descriptor data was collected for all above mentioned varieties. For known grape varieties information were transformed from old local ampelographies [1, 2] into standardized OIV [7] descriptors. For each variety 23 SSR fingerprinting data were collected and analyzed. According to genetic data all the varieties are considered to be true to type and are not clones. Microsatellite data analyses shown high level of polymorphism among the studied varieties. Expected heterozygosity for each locus ranged from 75.45% (VrZAG83) to 95, 25% (VVS 2), while observed heterozygosity varied from 36,64% (VVIN73) to 85,26% (VVIP31). The high rate of heterozygosity may be explained as a results of hybridization during grape domestication process [6] and is considered as a commonly observed among clonally propagated, outbreeding species [3]. Several OIV codes showed uniformity for characterized cultivars, for example code 051 (Young leaf: color of upper side of blade (4<sup>th</sup> leaf)), 068 (Mature leaf: number of lobes), 151 (Flower: sexual organs), 209 (Bunch: number of wings of the primary bunch), 502(Bunch: single bunch weight), 504(Yield per m<sup>2</sup>), 505 (sugar content of the must), for other OIV indicators, higher or smaller diversity was determined.

Below are a number of common and rare grape varieties. Cultivation of some of these varieties is not profitable due to low yields, but in compensation one may produce fine wines of unique flavors that can be in great demand in domestic and foreign markets. Descriptions of grape varieties and wines presented below are based on ampelographic, genetic data and the enological description based on Consumer test data.

### ***Arevik***



*Synonyms: Alaghurna, Arna grna, Spitak arevik, Aldara*

The name Arevik derives from Arevik village in Meghri region. Variety is more widely cultivated in Syunig region: Meghri and Kapan. Arevik is characterized by big or medium size, conical, pretty dense bunches, and big, round berries. The skin is thick, covered by layer of epicuticular wax, the flesh is dense, juicy and sweet. The clusters grown under the shadow have greenish color, which are grown under the sun are light

amber color. Variety is late ripening and high productive.

Arevik is used to make white table wines with unique flavor, as well as strong/full-bodied and fortified wines. Meghri's region famous dessert wine was made from Arevik variety.

### ***Bananc***



*Synonyms: Spitak Khaghogh, Rundvejs*

This variety typical to northeastern zone and partly to Ararat Valley (Ararat, Armavir and Aragatsotn regions) and belongs to oriental eco-geographical group. Bananc is characterized by big size, more often cylindrical sometimes conical, quite dense bunches and large, round, yellowish-green berries. The skin is thick, covered with dense layer of epicuticular wax, the flesh is juicy, with some tartness. Variety is late ripening and high productive.

Fully rip berries have low sweetness and acidity.

Bananc is used to make brandy, sparkling wines, table wines and juice. Variety gives well balanced wines with harmonious bouquet of taste.

### ***Tozot***



Tozot mainly grows in old vineyards of Vayots Dzor.

Tozot is characterized by different size, dense, conical bunches and medium size, black, slightly oval/elongated or ovate berries. The skin is medium thickness/thick, covered by a dense/bushy/heavy, bloom/epicuticular wax, the flash is juicy with pleasant taste. Variety is late ripening and high productive. Fully ripe berries have high sweetness and medium acidity.

Tozot is used to make wines with uniuquetaste and pleasant crispness.

***Garan dmak***

*Synonyms: Halivoruk, Anali khaghogh, Diq khardgi, Ankotch khardgi, Cancar khardgi*

Garan Dmak is common to Armavir and Artashat community of Ararat Region.

Garan dmak is characterized by big or medium size, usually dense, sometimes loose, cylindrical bunches, sometimes with wings and medium size, black, round, yellowish-green berries, if the sunny sides are amber colored. Because of the clusters, density/looseness variety also received Cancar (sparse) Kharji name. The skin is thick; the flesh is soft and juicy. Variety is late ripening and high productive, gives first harvest in third year of planting. Fully ripe berries have medium sweetness and acidity.

Garan dmak is used to make white wines: light or strong/light- or full bodied, depending on *terroir*.

***Lalvari***

*Synonyms: Glgan*

This variety common to north-eastern horticultural zone, mainly to Noyemberian region. The name of the variety derives from Lalvar Mountain.

Lalvari is characterized by big, dense; conical bunches, sometimes with wings from both sides and big, ovate berries. The clusters grown under the shadow have greenish berries, which are grown under the sun are light amber colored. The skin is rough, with small brown/grimy/dark spots covered by bloom/epicuticular wax layer, the flesh is soft and juicy with unique taste, juice is colorless. Variety is medium ripening and low productive. Fully ripe berries have low sweetness and high acidity.

Lalvari is used to make sparkling wines and light table wines well-balanced and tart. It is used also as a table grape.

***Khatun Khardgi***

Khatun Khardgi may grow in old vineyards of Vayots Dzor.

Khatun Khardgi is characterized by medium size, medium dense, conical or cylindrical bunches and medium size, round, yellowish-green or yellow berries, with small brown/grimy/dark spots. The skin is thick, the flesh is juicy, with unique aroma, and the juice is colorless. Variety is medium ripening and high productive. Fully ripe berries have high sweetness and moderate acidity.

Khatun Khardgi is wine variety, used to make wines with unique taste and crispness.

Aromas and flavors include field flowers, honey, pumpkin and pineapple bouquet.





### ***Qrdi khaghogh***



*Synonyms: Qrdi tchakat*

Qrdi Tchakat mainly grows in Vayots Dzor region.

The bunch is medium size, cylindrical with wings, medium dense. The berry is big or small size, slight ellipsoid, greenish. The skin is medium thick. The flash is juicy, with pleasant and harmonious taste. The berries have low level of sweetness and high acidity. Grape is highly productive and late ripening variety.

Qrdi tchakat is characterized by medium size, medium dense, cylindrical bunches, with wings

and big or small, greenish, slight ellipsoid berries. The skin is medium thick, the flash is juicy, with pleasant and harmonious taste, Variety is late ripening and high productive. Fully ripe berries have low sweetness and high acidity.

Qrdi tchakat is universal grapevine variety, is used for making assembled red wines, in blend with other grapes varieties.

### ***Tchilar***



*Synonyms: Tchilal, Tchilar, Skhtoruk, Aghvesi poch*

Tchilar is mostly cultivated in the regions of Aragatsotn and Kotayk, also in communities of Ashtarak and Etchmiadzin.

Tchilar is characterized by medium size, dense or loose, cylindrical or cylindrical-conical bunches, which looks like a fox tail/fox tail like, where variety received Aghvesi potch (Fox tail) name from. Berries are medium in size or large, round/ellipsoid or ovate, greenish or yellowish-green, on the sun side it has brown/grimy/dark spots. The skin is thick, covered by a thin bloom/layer of epicuticular wax, the flash is

juicy, with unique/special aroma, Variety is mid-late ripening and high productive. Fully ripe berries have moderate sweetness and high acidity.

Tchilar is high quality wine variety and used to make table wines full-bodied, with harmonious bouquet of taste and dessert wines, also fortified style wines.

### ***Movuz***



*Synonyms: Milari, Milahi, Meleji, Sev urza, Urdisi, Milay Chernyi, Milakhi, Urza Sev, Areni Chernyi*

Movuz is mainly grown in Ararat and Vayots Dzor regions.

Movuz is characterized by medium size, very dense, conical, sometimes cylindrical bunches, with wings and large, black, broad ellipsoid or ovate berries. The skin is thick and rich colored, covered with medium thick/dense layer of bloom/epicuticular wax, the flash is very thick and colorless. Variety is late ripening and medium productive. Fully ripe berries have

high sweetness and low acidity.

Movuz is used to make light and full-bodied refined table wines with freshness, silky roundness and a wonderful bouquet. Well balanced acidity and tannic wine finishes with notes of honey, laurel and vanilla.

***Movses***

Unique plants of Movses are preserved in old vineyards of Vayots Dzor.

In Soviet times, it was attributed to over 100 years old vineyards of Vayots Dzor region, community of Aghavnadzor.

Movses is characterized by big, sometimes medium and small size, dense, occasionally very or medium in density, cylindrical, rarely conical bunches and large, deep red, almost black, ovoid berries. The skin is medium thick, covered with medium thick/dense layer of bloom/ epicuticular wax, the flash is juicy with harmonious and pleasant taste. Variety is late ripening and medium productive. Fully ripe berries have low sweetness and low acidity.

Movses is wine variety, used to make wines with unique taste and crispness.

***Mormor***

*Synonyms: Ampagujn khaghogh, Mokhragujn khaghogh*

Mormor is mainly preserved in old vineyards of Vayots Dzor.

Mormor is characterized by medium size, medium dense, conical bunches and medium, rarely big, grey, ellipsoid berries. The skin is medium thick, covered with thick/dense layer of bloom/epicuticular wax, the flash is juicy with harmonious and pleasant taste. Variety is late ripening and medium productive. Fully ripe berries have high sweetness and moderate acidity.

Mormor is wine variety, used to make wines with unique taste. Compound and refined/delicate, well-balanced with red berries taste and silky roundness. Also used in blend with other grapes varieties.

***Mskhali***

*Synonyms: Dolband, Spitak khaghogh*

Mskhali mainly grows in Armavir and Ararat regions.

Mskhali is characterized by medium size, loose or dense, cylindrical-conical or conical, bunches sometimes with wings and big or medium, white with yellowish or yellowish-green hue, round berries. The skin is thick, transparent, covered by a slight bloom/ epicuticular wax and brown points/spots, the flash is juicy, squashy, and colorless with pleasant taste. Variety is late ripening and high productive, gives first harvest in third to fourth year of planting and goes into complete fertility in the seventh to eighth year. Fully ripe berries have low sweetness and medium acidity.

Mskhaly from foothills are used to make soft table wines crispy, harmonious/balanced, refreshing and from plains, strong/full-bodied table wines with well balanced. Also used as a raw material for brandy and juice production. Sometimes is used also as a table grape and in raisins production.



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