

# USING OF CLUSTER ANALYSIS FOR COARNĂ NEAGRĂ GRAPEVINE VARIETY AND ITS DESCENDENTS

## ANALIZA CLUSTER LA SOIURILE DE VIȚĂ DE VIE PROVENITE DIN COARNĂ NEAGRĂ

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**Abstract.** *The Coarnă neagră grapevine variety was used as maternal genitor in the creation of some new grapevine varieties. Of these varieties, the author have chosen Coarnă neagră selecționată, Azur, Milcov, Gelu, Ozana and Mara with which, on the basis of Cluster analysis will determine the phenotypical similarity among the Coarnă neagră varieties genitor and its descendants, with a view to establish the polyphyletic groupings among the biological material under analysis.*

**Key words:** *Cluster analysis, grapevine variety, phenotypical similarity, descendants*

**Rezumat.** *Soiul de viță de vie Coarnă neagră a fost folosit ca genitor matern pentru a obține creații noi românești de viță de vie. Dintre acestea autorul a ales soiurile Coarnă neagră selecționată, Azur, Milcov, Gelu, Ozana și Mara cu ajutorul cărora, pe baza analizei Cluster se va determina gradul de asemănare fenotipică dintre soiul Coarnă neagră și descendenții săi, cu scopul de a se stabili grupurile polifiletice din materialul biologic supus analizei.*

**Cuvinte cheie:** *analiza cluster, soi de viță de vie, asemănări fenotipice, descendeți*

### INTRODUCTION

Coarnă neagră is an old grapevine variety with an oriental origin, cultivated for a long time in Romania, becoming a domestic variety. Being very well adapted to the local conditions, there were created new varieties based on it: Coarnă neagră selecționată, Azur, Milcov, Gelu, Ozana and Mara (Țârdea and Rotaru, 2003).

In order to determine the phenotypic similarities between the varieties of this group, it has been used the cluster analysis, which admits the existence of polythetic groups (similar groups of varieties /groups like varieties) and simultaneously measuring the similarity of the elements of the group and the difference between groups (Rotaru, 2000; Bosoi et al., 2011).

Based on this analysis, it was determined: the chaining / kinship levels of the varieties analyzed, the values of chaining, the histogram classification of the varieties analyzed and the dendrogram of the similarity of varieties (Rotaru, 2004).

### MATERIAL AND METHOD

There was collected a total of 10 adult leaves from the Coarnă neagră variety as genitor and his descendants, considered each as monothetic groups. Based on

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leaf architecture, there were established 51 benchmarks and has been made 68 direct ampelometric measurements. The data obtained had allowed calculation of 53 ampelometric values: amounts, ratios, product, etc. (fig. 1). For the symmetrical characters, both values were measured and calculated (Bosoi et al., 2011).

These measurements allowed to compile a statistical population made up of rows of variation of 30 values for all 121 characters analyzed on the 7 varieties under study. The genetic material analyzed is presented in table 1. (Rotaru, 2000).

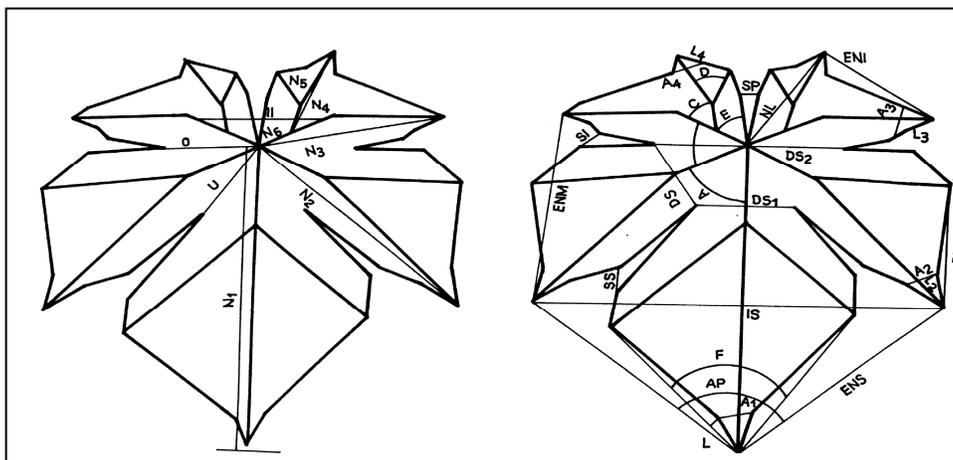
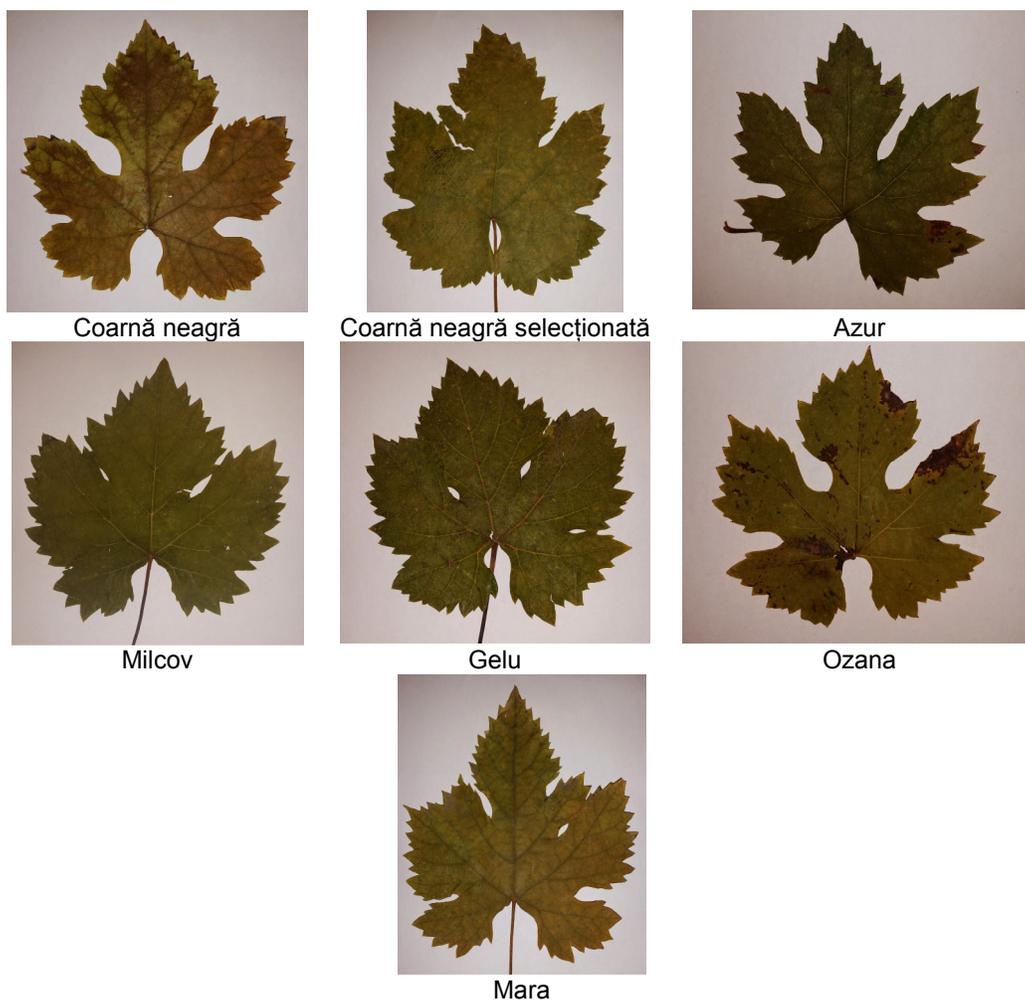


Fig. 1 – Schematic representation of characters examined at grapevine leaf

Table 1

The genetic material studied

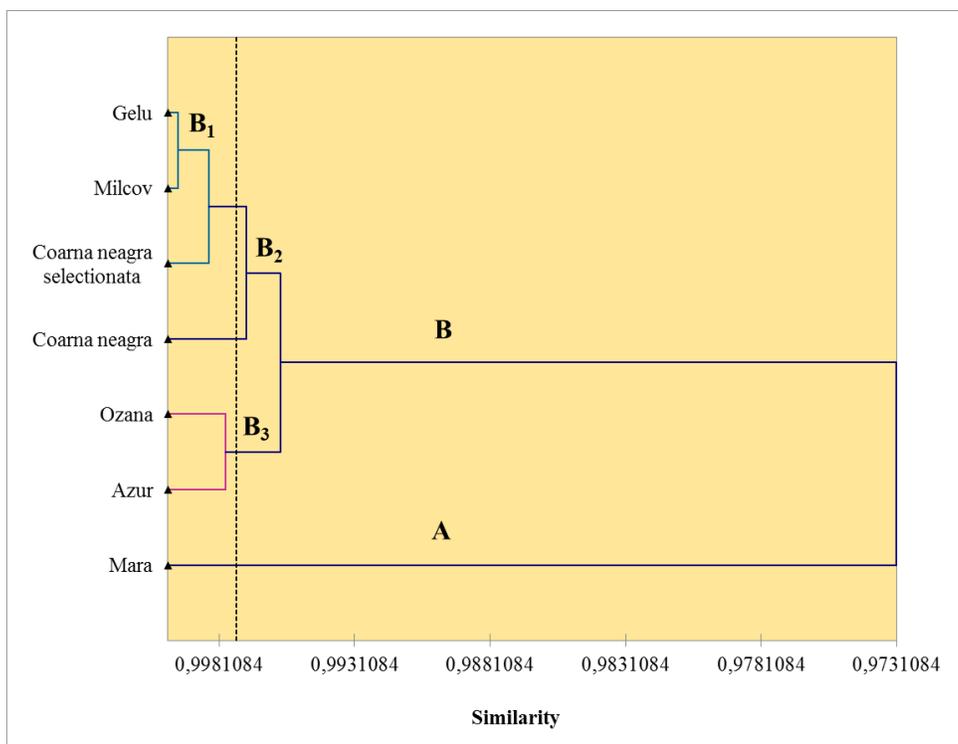
Variety name	Genitors	Homologation year	Authors and the unity where has been approved
Coarnă neagră	Oriental origin	-	-
Coarnă neagră selecționată	Free fertilization of the Coarnă neagră variety	1970	Constantinescu Gh., Negreanu Elena, Agronomy Institute N. Balcescu, București
Azur	Coarnă neagră x Cardinal	1984	Lepădatu Victoria și Condei Gh., SCVV Drăgășani
Milcov	Coarnă neagră x Muscat de Hamburg	1988	Bădătescu Margareta, Varga N., Zaharia V., Coman Gh., SCVV Odobești
Gelu	Free fertilization of the Coarnă neagră variety whose hybrid seeds were irradiated with X rays	1997	Calistru Gh., Damian Doina, SCDVV Iași
Ozana	Free fertilization of the Coarnă neagră variety	1982	Dănulescu D. și colab., SCVV Iași
Mara	SV 12303 x Ozana	2011	Damian Doina, Calistru Gh., Nechita Ancuța, Savin C., SCDVV Iași



**Fig. 2 – Biological material studied**

## **RESULTS AND DISCUSSIONS**

In preparing the hierarchical classification dendrogram of the genetic material, was used Pearson's correlation coefficient (generalized Ward criterion), expressed by the numerical value of the similarity index (figure 3) (Lazarevski, 1946; Rotaru, 2000).



**Fig. 3 – Varieties dendrogram**

The higher the similarity index value is the more phenotypically similar are the varieties that make up the groups.

From analysis of the dendrogram it is found the existence of two polythetic major groups of the Coarnă neagră variety descendants.

Regarding the first group, i.e. B, it is composed of other 3 subgroups.

In the first B<sub>1</sub> subgroup, the first varieties that unite and have the closest phenotypic similarity are the Gelu and Milcov varieties, because they have the biggest chaining index, i.e. 0.9996. These have the biggest similarity from all 7 varieties studied. The variety that closes this subgroup is the Coarnă neagră selecționată variety, with a chaining index of 0.9984.

The second B<sub>2</sub> subgroup is represented by the previous subgroup plus Coarnă neagră variety, with a chaining index of 0.9970.

The third B<sub>3</sub> subgroup is represented by the previous subgroups plus two varieties that are very similar, Ozana and Azur varieties. To these two varieties the chaining index is 0.9978. This subgroup B<sub>3</sub> unites with the previous B<sub>2</sub> subgroup with a chaining index of 0.9958.

The second group, i.e. A, is represented by the Mara variety which unite with the rest of the dendrogram with a chaining index of 0.9731.

Concatenation levels in developing varieties dendrogram

Concatenation levels	The number of varieties on a level	Similarity index value
Gelu ~ Milcov	2	0.9996
Gelu ~ Milcov ~ Coarnă neagră selecționată	3	0.9984
Ozana ~ Azur	2	0.9978
Gelu ~ Milcov ~ Coarnă neagră selecționată ~ Coarnă neagră	4	0.9970
Gelu ~ Milcov ~ Coarnă neagră selecționată ~ Coarnă neagră ~ Ozana ~ Azur	6	0.9958
Gelu ~ Milcov ~ Coarnă neagră selecționată ~ Coarnă neagră ~ Ozana ~ Azur ~ Mara	7	0.9731

Regarding leaf architecture, it is found that the varieties with the biggest similarity, Gelu and Milcov, have orbicular leaves, tri or pentalobed, with the lateral sinuses with a fit deep and closed ovoid, and the petiole sinus in the shape of lyre more or less open. The next variety that unite is Coarnă neagră selecționată which is different from the others through terminal elongated and sharp lobe, and the lateral sinuses less pronounced and open.

The classic Coarnă neagră variety differs in that the lateral sinuses are less deep, the upper sinuses are in the shape of lyre with sharp base, and the petiole sinus in the shape of an open V.

The two varieties which belong to the B<sub>3</sub> semi group, Ozana and Azur, are similar regarding the architectonics of the adult leaf, the difference being the elongated terminal lobe to Azur, short and wide to Ozana. Also, the petiole sinus is open in the shape of V to Azur, whereas to Ozana the petiole sinus is open in the shape of U.

The Mara variety which is totally different from group B, i.e. all of other varieties, differs in that having in its genetic formula a resistant variety (SV 12303), makes the cogging to be more pronounced, the leaf to be bigger, arrow-headed/cuneiform, pentalobed, sometimes with additional lobes, and the petiole sinus to be open in the shape of a lyre (Alleweldt and Dettweiler, 1986).

## CONCLUSIONS

The use of the statistical-mathematical methods (the cluster analysis) in determine the phenotypic similarity of Coarnă neagră variety and its descendants revealed the following:

- The varieties which have the highest chaining index are Gelu and Milcov, which shows the high phenotypic similarity to leaf that exist between these two varieties.

- Between the 4 major polythetic groups of the descendants of the Coarnă neagră variety, the closest to this is the first group, with a chaining index of 0.9970, a group consisting of Gelu, Milcov and Coarnă neagră selecționată variety.

- Mara variety has the lowest similarity because of the low chaining index, i.e. 0.9731, which further emphasizes that this is a hybrid. Also it can be seen in its genetic formula a resistant variety (SV 12303), which makes the cogging to be more pronounced, the leaf to be bigger, arrow-headed/cuneiform, pentalobed, thus differing from the other studied varieties.

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