

THE APPLICATION OF FRACTAL ANALYSIS TO THE COARNĂ SORTOGROUP

APLICAREA ANALIZEI FRACTALE LA SORTOGRUPUL COARNĂ

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Abstract. *Coarnă neagră and Coarnă albă vine varieties were used as maternal genitor in order to obtain new romanian vine creations. Out of these were included in the study Coarnă neagră selecționată, Azur, Milcov, Gelu, Ozana and Mara varieties within Coarnă neagră sortogroup. After applying the fractal analysis, it was determined the differences between the parent variety and its descendants. It resulted the fact that the fractal dimension closest to Coarnă neagră variety it is owned by Coarnă neagră selecționată variety (1.0389) and the farthest it is owned by Ozana variety (1.1254). For the Coarnă albă sortogroup, the value closest to the genitor was 1.0855, at Miorița variety, and the furthest was at Muscat Timpuriu de București variety of 1.1124.*

Keywords: fractal analysis, Coarnă albă, Coarnă neagră, vine

Rezumat. *Soiurile de viță de vie Coarnă neagră și Coarnă albă au fost folosite ca genitor matern pentru a obține creații noi românești de viță de vie. Dintre acestea au fost luate în studiu soiurile Coarnă neagră selecționată, Azur, Milcov, Gelu, Ozana și Mara în cadrul sortogrupului Coarnă neagră. În urma aplicării analizei fractale s-au determinat diferențele dintre soiul mamă și descendenții săi. A rezultat faptul că dimensiunea fractală cea mai apropiată de soiul Coarnă neagră o are Coarnă neagră selecționată (1,0389), iar cea mai îndepărtată o are soiul Ozana (1,1254). La sortogrupul Coarnă albă, valoarea cea mai apropiată de genitor a fost de 1,0855, la soiul Miorița, iar cea mai îndepărtată, la soiul Muscat Timpuriu de București, de 1,1124.*

Cuvinte cheie: analiză fractală, Coarnă albă, Coarnă neagră, viță de vie

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.

Coarnă albă is also a very old grapevine variety, cultivated especially in Moldova. It is assumed that was brought from Minor Asia (Turkey). On the basis of this variety, there were created other new varieties: Miorița and Muscat Timpuriu de București (Țârdea and Bosoi, 2010).

Given these ten grapevine varieties, using fractal analysis it will be determined the fractal dimension, in order to establish the degree of similarity of these two groups of grapevines (Mancuso, 1999; Secelean, 2002; Oancea, 2006).

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MATERIAL AND METHOD

The biological material necessary for this method was represented by 10 adult leaves for each variety of the 2 groups of grapevine (tab. 1). Every leaf has been scanned and then processed so in the end to have the leaf colored in black on white background. After that, this image will be loaded into the Harfa program which will give us the fractal dimension of each leaf (Zmeskal *et al.*, 2001). With these values we can determine the degree of similarity for each group of grapevine.

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, Condei Gh., SCVV Drăgășani
Milcov	Coarnă neagră x Muscat de Hamburg	1988	Bădițescu 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. et al., SCVV Iași
Mara	SV 12303 x Ozana	2011	Damian Doina, Calistru Gh., Nechita Ancuța, Savin C., SCDVV Iași
Coarnă alba	Oriental origin	-	-
Miorița	Free fertilization of Coarnă alba variety	1980	Popescu Gh., Bădițescu Margareta, Varga N., Zaharia Victoria, SCVV Odobești
Muscat Timpuriu de București	Coarnă albă x Regina viilor	1970	Gh. Constantinescu, Elena Negreanu, Agronomy Institute N. Bălcescu, București

RESULTS AND DISCUSSIONS

The results obtained by Harfa program for Coarnă neagră group, are presented graphic in figure 1 and listed in table 2 and the results obtained for Coarnă albă group are listed in table 3 and represented graphic in figure 3.





Table 2

Fractal dimensions for Coarnă neagră group

Grapevine variety Leaf number	Azur	Coarnă neagră	Coarnă neagră selecționată
1	1.0697	1.0581	1.0646
2	1.0899	1.0643	1.0274
3	1.0979	1.0160	1.0093
4	1.1100	1.0135	1.0480
5	1.0983	1.0245	1.0225
6	1.0845	1.0346	1.0467
7	1.0723	1.0198	1.0458
8	1.0786	0.9951	1.0258
9	1.0987	1.0515	1.0231
10	1.0721	1.0551	1.0755
Average	1.0872	1.0333	1.0389
			

Continue of table 2

Fractal dimensions for Coarnă neagră group

Variety Leaf number	Gelu	Mara	Milcov	Ozana
1	1.0428	1.0229	1.0011	1.1343
2	1.0518	1.0325	0.9995	1.1310
3	1.0537	1.0095	1.0177	1.1112
4	1.0571	0.9951	1.0200	1.0992
5	1.0383	0.9883	1.0570	1.1526
6	1.0118	0.9788	1.0309	1.1220
7	1.0442	1.0048	1.0224	1.1570
8	0.9931	1.0183	1.0414	1.0868
9	1.0062	1.0048	1.0576	1.1356
10	1.0048	1.0122	1.0377	1.1239
Average	1.0304	1.0067	1.0285	1.1254
				

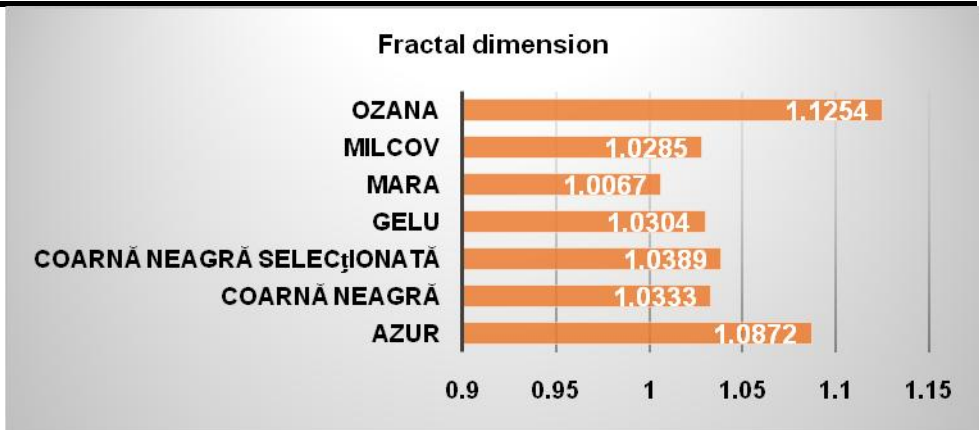


Fig.1 Fractal dimensions for Coarnă neagră group (averages)

From the analysis of data obtained is observed that the mean values of fractal dimension of the leaf vine varieties studied in Coarnă neagră group, varies between 0.9788 at Mara variety and 1.1570 at Ozana variety. Intermediate values of the fractal dimension had all the other five varieties, Azur (1.0697), Coarnă neagră (1.0643), Coarnă neagră selecționată (1.0646), Gelu (1.0571) and Milcov (1.0576). By comparing Coarnă neagră with his descendants, it can be seen that the varieties Coarnă neagră selecționată, Gelu and Milcov had values close to it, while Mara and Ozana have values significantly different from Coarnă neagră.

In figure 2 we can see the minimum fractal dimension obtained at Coarnă neagră group.

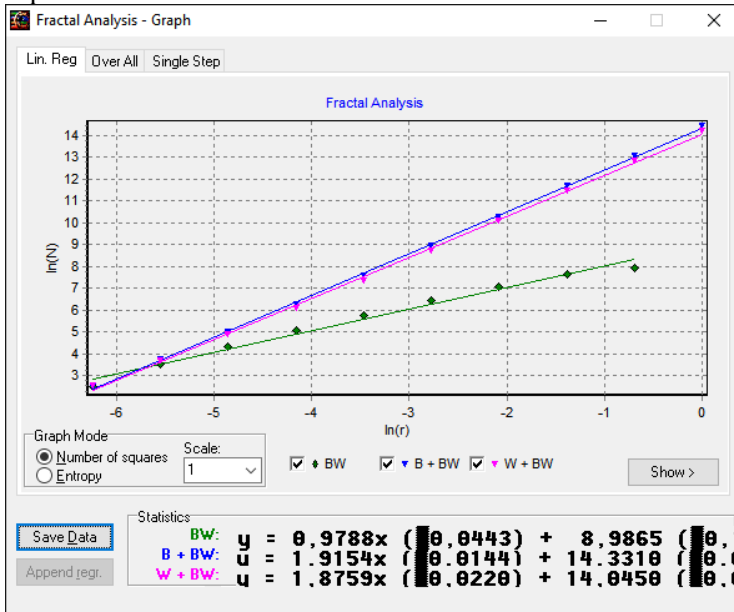





Fig. 2 Minimum fractal dimension for Coarnă neagră group

Fractal dimensions for Coarnă albă group

Grapevine variety Leaf number	Muscat Timpuriu de București	Miorița	Coarnă albă
1	1.1088	1.0537	1.0408
2	1.1168	1.0732	1.0584
3	1.0783	1.1295	1.0526
4	1.1073	1.1522	1.0560
5	1.1195	1.0691	1.0652
6	1.1029	1.0756	1.0436
7	1.0879	1.1116	1.0970
8	1.1726	1.0729	1.0653
9	1.0858	1.0497	1.0292
10	1.1442	1.0671	1.0322
Average	1.1124	1.0855	1.0540
			

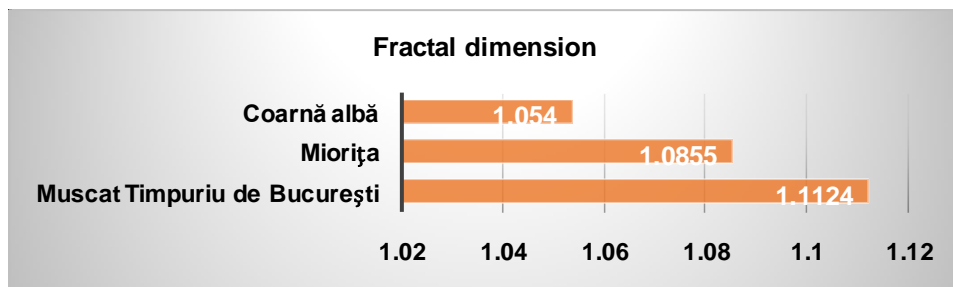


Fig. 3 Fractal dimensions for Coarnă albă group (averages)

The mean values of fractal dimension of the leaf vine varieties studied in Coarnă albă group, varies between 1.0292 Coarnă albă variety and 1.1726 at Muscat Timpuriu de București variety.

Intermediate values of the fractal dimension had all three varieties, Muscat Timpuriu de București (1.1029), Miorița (1.0497) and Coarnă albă (1.0970).

By comparing Coarnă albă with his descendants, it can be seen that the Miorița variety had a value very close to it, while Muscat Timpuriu de București variety it had an average value with a difference of over 0.5 against Coarnă albă variety.

In figure 4 we can see the minimum fractal dimension obtained at Coarnă albă group.

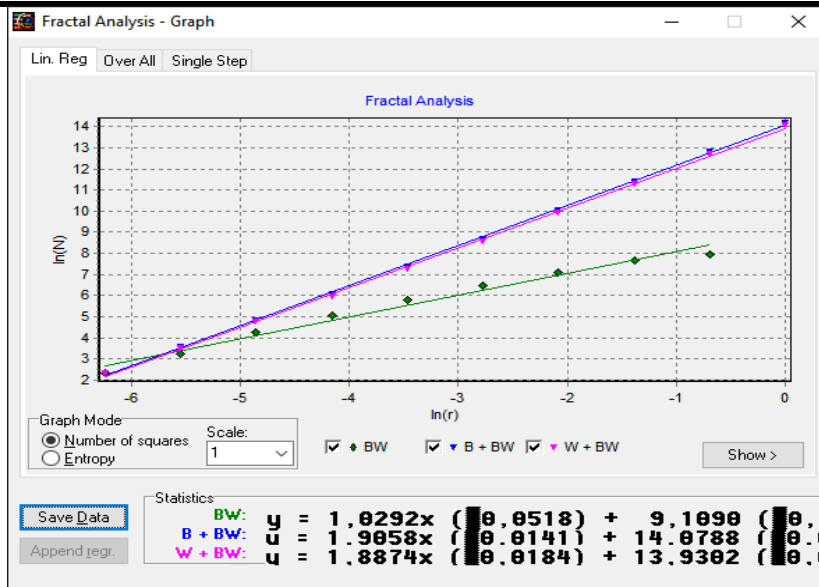


Fig. 4 Minimum fractal dimension for Coarnă albă group

CONCLUSIONS

Fractal analysis in Coarnă neagră group revealed the following:

- average values of fractal dimension of leaves from Coarnă neagră vine varieties varies between 0.9788 at Mara variety and 1.1570 at Ozana variety;
- values close to the Coarnă neagră variety had Coarnă neagră selecționată, Gelu and Milcov, while Ozana and Mara had very different values.

Fractal analysis in Coarnă albă group revealed the following:

- average values of fractal dimension of leaves from Coarnă albă vine varieties varies between 1.0292 at Coarnă albă variety and 1.1726 at Muscat Timpuriu de București variety;
- values close to the Coarnă albă variety had Miorița variety, with 0.0315 more then, while Muscat Timpuriu de București had an average value with a difference of over 0.5 against Coarnă albă variety.

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