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THE ASSESSMENT OF PURITY AND TYPOLOGY OF THE 'PINOT GRIS' CULTIVAR, CULTIVATED IN THE MURFATLAR WINE-GROWING CENTER, THROUGH SYSTEMS BASED ON AMPELOMETRY

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Abstract

A study on ten 'Pinot Gris' cultivar elites was carried on at the Research Station for Viticulture and Enology Murfatlar during the 2021-2022 wine year aimed to authenticate plantation specimens. Ten elites (H1-H10), each with similar growth force, had ten leaves harvested during veraison from the middle part of the shoot. Using a planimeter with 0.1 mm precision, leaf vein length and main angle size were measured. These elites were compared to a control vine from the base plantation. Analysis showed H4, H8, H6, and H9 could be new biotypes for further agrobiological study. H1, H3, and H7 did not differ from the control, suitable for multiplication and maintaining cultivar authenticity. The variation coefficient remained below 30%, ensuring homogeneity and representativeness in the study.

Key words: *ampelometry, typicity, clonal elites, grapevine.*

INTRODUCTION

The distribution of grapevine cultivars in our country stems from the combined action of numerous factors, among which those of particular importance include: the tradition of viticultural regions (Dejeu, 2010; Teodorescu, 1964), the vocation and pedoclimatic potential of different viticultural areas (Oslobeanu et al., 1991), ecological constraints in certain viticultural areas (Bucur et al., 2016; Cichi, 2021; Costea et al., 2008; Irimia et al., 2014; Toti et al., 2017), the varying requirements of grapevine varieties in relation to pedoclimatic factors (Bunea et al., 2017; Dobrei et al., 2016; Rotaru, 2009), as well as technical-organizational restrictions and socio-economic criteria (Olteanu et al., 2002; Cichi, 2022).
Ampelometry represents a method by which grapevine cultivars are identified and described, parameterizing the biometric characteristics of mature leaves through a series of numerical data. The application of this method remains relevant due to the continuous development of information technology and the numerous possibilities for data processing and interpretation, providing valuable insights into the classification of cultivars into different groups, the degree of relatedness between cultivars, as well as their differentiation.

MATERIALS AND METHODS

The research was conducted during the viticultural year 2021-2022 and consisted of studying ten elites of the 'Pinot Gris' cultivar. In order to evaluate the authenticity of the individuals kept in the ampelographic collection of the Research and Development Station for Viticulture and Oenology Murfatlar, the following methodology was applied: Ten vines of the same growth force, referred to as elites (H), were selected, each exhibiting certain characteristics different from those specific to the reference 'Pinot Gris' cultivar (leaf colour, pubescence), labelled as H1 - H10. From each vine, 10 leaves were harvested from the middle third of the shoot, during the veraison phase.
The shoots exhibited the same stage of development and had identical insertion levels. A series of measurements were carried out, focusing on ampelometric characteristics taken from the list of OIV descriptors, namely: The length of the median main vein - N1, length of

the upper lateral main vein - N2, length of the lower lateral main vein - N3, length of the lower secondary vein - N4, angle size between N1 and N2 - α, angle size between N2 and N3 - β, angle size between N3 and N4 - γ, and the following statistical indices were calculated: arithmetic mean, variance, standard deviation, and coefficient of variation.

RESULTS AND DISCUSSIONS

The 'Pinot Gris' cultivar (Figure 1) has a short vegetation period (160-170 days) and moderate vigor, showing good tolerance to frost and drought, and poor resistance to gray mold and powdery mildew. The mature leaf is slightly rounded, medium to small in size, with a thick, wrinkled, dark green lamina, with fine scales. There is a great variability regarding the number of lobes, depth, and shape of the lateral sinuses. Towards the tip of the shoots, there are entire leaves, while towards the base there are leaves with 3-5 lobes. The terminal lobe is short and rounded, and the upper lateral sinuses are closed with an oval lumen or open in a helical shape. In the Murfatlar vineyard, full ripening of the grapes begins in the second decade of September.

Figure 1. Mature leaf of the 'Pinot Gris': cultivar

Ampelometric descriptors target the biometric characteristics of the leaf. In order to determine them, for the 'Pinot Gris' variety, 10 vines of the same vigor, named elites (marked H1- H10), were selected, from which 10 mature leaves were harvested, located in the middle third of the shoot, with the same insertion level on the one-year-old cord, during July-August (veraison phase). The 10 leaves harvested from each vine were copied onto paper, after which, using a planimeter (vernier caliper) with a precision of 0.1 mm, the length of the veins N1, N2, N3, N4 and the size of the main angles α, β, γ were measured and determined (Figure 2).

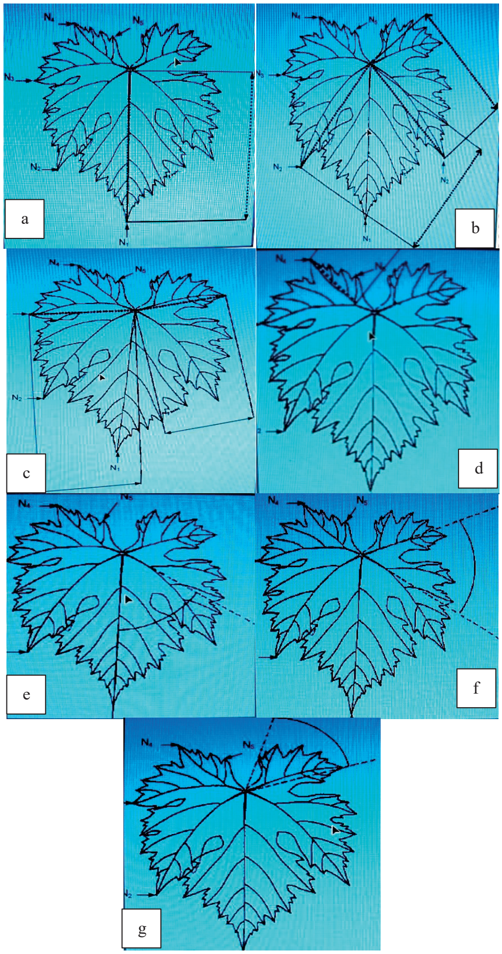

Figure 2. Ampelometric descriptors (after Oșlobeanu et al., 1980): a. Length of vein N1; b. Length of vein N2; c. Length of vein N3; d. Length of vein N4; e. Angle size between N1 and N2, measured at the first bifurcation (α); f. Angle size between N2 and N3, measured at the first bifurcation (β); g. Angle size between N3 and N4, measured at the first bifurcation (γ)

The permanent and evident change in climate factors due to global warming can be determining causes of the variability recorded in the 'Pinot Gris' cultivar in the plantation. The studied cultivar presents a high variability, requiring a continuous selection oriented towards maintaining biological purity as well as towards identifying new valuable biotypes.

Very significant negative differences were recorded in elite H4 for the following traits:

- Length of median main vein N1 (-3.42 cm); Length of upper lateral main vein N2 (-3.56 cm); Length of lower lateral main vein N3 (-2.51 cm); Length of lower secondary vein N4 (-1.46 cm).
- Significant negative differences were recorded in elite H2 for the trait Length of upper lateral main vein N2 (-1.02 cm).
- Very significant positive differences were recorded in elite H8 for the following traits: Length of median main vein N1 (+1.79 cm) and Length of upper lateral main vein N2 (+1.76 cm).

The coefficient of variation had the following values for:

- Length of median main vein N1: moderate value in elite H4 (14.86); low value, ranging from 3.70 to 8.83, in the other variants.
- Length of upper lateral main vein N2: low value, ranging from 3.54 to 9.62 for all elites.
- Length of lower lateral main vein N3: low values (4.06-7.99) for most variants; moderate value for variant H7 (10.65).
- Length of lower secondary vein N4: elites H1, H2, H4, H5, H8, H9, and H10 showed moderate variation with values ranging from 10.65 to 20.00; low variation for the rest of the elites (Table 1, Figure 3).

Table 1 The variability of the ampelometric characteristics (length of veins N1, N2, N3, and N4) in the 'Pinot Gris' variety

Character	**Length of median main vein N1 (cm)**				**Length of upper lateral main vein N2 (cm)**				**Length of lower lateral main vein N3 (cm)**				**Length of lower secondary vein N4 (cm)**			
Estimator Variant	X±Sx	S%	Diff. +/-	Sig.	X±Sx	S%	Diff. +/-	Sig.	X±Sx	S%	Diff.+/-	Sig.	X±Sx	S%	Diff.+/-	Sig.
H1	10.78±0.41	8.56	-0.31	-	9.72±0.36	8.21	0	-	6.80±1.24	7.99	-0.33	-	4.00±0.29	16.20	-0.48	-
H2	9.96±1.39	8.83	-0.51	-	8.70±0.14	3.54	-1.02	0	6.82±0.16	5.23	-0.31	-	4.62±0.22	10.65	+0.14	-
H3	10.74±0.23	4.78	+0.27	-	9.38±0.20	4.85	-0.34	-	6.72±0.09	6.86	-0.41	-	3.98±0.05	2.75	-0.50	-
H4	7.05±0.47	14.86	-3.42	000	6.16±0.20	7.14	-3.56	000	4.62±0.15	7.28	-2.51	000	3.02±0.20	14.55	-1.46	000
H5	11.00±0.17	3.46	+0.59	-	10.48±0.45	9.62	+0.76	-	8.02±0.19	5.32	+0.89	**	5.44±0.28	11.38	+0.96	*
H6	11.14±0.34	6.91	+0.67	-	9.76±0.30	6.90	+0.04	-	6.96±0.22	7.16	-0.17	-	4.20±0.16	8.75	-0.28	-
H7	10.76±0.42	8.73	+0.29	-	9.50±0.18	4.34	-0.22	-	6.66±0.31	10.65	-0.47	-	4.04±0.13	7.54	-0.44	-
H8	12.26±0.32	5.81	+1.79	***	11.48±0.37	7.11	+1.76	***	7.90±0.27	7.65	+0.77	**	4.48±0.34	16.96	0	-
H9	11.24±0.39	5.32	+0.77	*	10.38±0.39	8.35	+0.66	-	7.80±0.21	6.08	+0.67	*	5.12±0.27	11.83	+0.64	-
H10	9.86±0.16	3.70	-0.61	-	8.92±0.25	6.21	-0.80	-	6.66±0.12	4.06	-0.47	-	4.46±0.41	20.71	-0.02	-
CONTROL	**10.47± 0.35**				**9.72± 0.18**				**7.13± 0.16**				**4.48±0.21**			
DL	DL 5% = 0.96 DL 1% = 1.30 DL 0.1% = 1.72				DL 5% = 0.85 DL 1% = 1.14 DL 0.1% = 1.51				DL 5% = 0.62 DL 1% = 0.84 DL 0.1% = 1.11				DL 5% = 0.73 DL 1% = 0.98 DL 0.1% = 1.29			

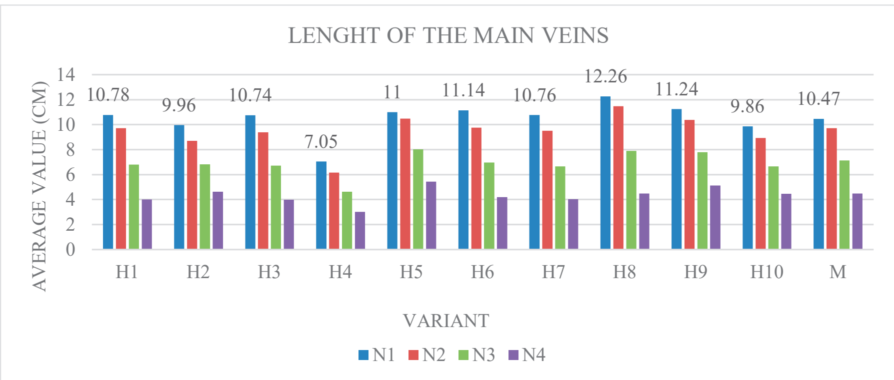

Figure 3. Graphic representation of the variant for the characteristic Length of veins N1, N2, N3, N4 compared to the control

Following the analysis of the significance of differences compared to the control regarding the ampelometric characteristics (angle size), the following observations were made:

- Very significant negative differences were recorded in elite H4 for the following traits: Angle size α between N1 and N2 (-18°13´); Angle size γ between N3 and N4 (-14°9´).
- Distinctly significant negative differences were recorded for the trait: Angle size α between N1 and N2 (-5°7´) in elite H9; Angle size β between N2 and N3 (-11°18´) in elite H4.
- Significant negative differences were recorded for the trait: Angle size α between N1 and N2 in H10 (-4°8´); Angle size γ between N3 and N4 in H6 (-6°7´).

The coefficient of variation had the following values for:

- Trait Angle size α between N1 and N2: Low variation in elites: H1 (7.86); H3 (8.15); H8 (5.48); H9 (6.29) and H10 (9.46); Moderate variation in elites H2 (10.50), H5 (11.22), H6 (12.25), and H7 (10.94); High variation in elite H4 (20.33).
- Trait Angle size β between N2 and N3: Low value in elites H2, H6, H8, H9, and H10 ranging from 5.08 to 9.20; Moderate value in elites H3, H5, H7 (10.76-13.20); High value in elite H4 (20.95).
- Trait Angle size γ between N3 and N4: Low variation in elites H1, H5, H7, H8, H9, with values ranging from 5.42 to 9.09; Moderate variation in elites H2, H3, H4, H6, and H10, with values ranging from 11.35 to 14.49 (Table 2, Figure 4).

Table 2. Variability of ampelometric characteristics (angle size α, β, γ) in the 'Pinot Gris' cultivar

Character	**Angle size between N1 and N2 (α)**				**Angle size between N2 and N3 (β)**				**Angle size between N3 and N4 (γ)**			
Estimator / Variant	X±Sx	S%	Diff.+/-	Sig.	X±Sx	S%	Diff. +/-	Sig.	X±Sx	S%	Diff.+/-	Sig.
H1	59.4±2.09	7.86	+4.7	*	53.00±2.55	10.76	+2.96	-	53.40±1.89	7.20	+2.1	-
H2	57.4±2.69	10.50	+2.7	-	55.00±2.10	8.54	+4.96	-	55.20±3.18	12.90	+39	-
H3	55.80±2.03	8.15	+1.1	-	54.20±3.20	13.20	+4.16	-	52.20±3.38	14.49	+0.9	-
H4	36.57±3.33	20.33	-18.13	000	38.86±3.64	20.95	-11.18	00	36.31±1.97	12.16	-14.9	000
H5	56.00±2.81	11.22	+1.3	-	48.20±2.52	11.68	-1.40	-	49.20±1.32	6.00	-1.2	-
H6	53.40±2.93	12.25	-1.3	-	46.60±1.96	9.43	-3.44	-	44.60±2.77	13.88	-6.7	0
H7	59.00±2.89	10.94	+4.3	*	55.20±3.08	12.51	+5.16	-	59.40±2.20	8.29	+8.1	-
H8	53.80±1.32	5.48	-0.9	-	47.00±1.70	8.12	-3.04	-	55.00±2.24	9.09	+3.7	-
H9	49.00±1.38	6.29	-5.7	00	44.00±1.00	5.08	-6.04	-	47.80±1.16	5.42	-3.5	-
H10	49.80±2.11	9.46	-4.8	0	51.00±2.10	9.20	+0.96	-	47.20±2.40	11.35	-4.1	-
CONTROL	**54.70**				**50.04**				**51.30**			
DL	DL 5% = 4.04 DL 1% = 5.41 DL 0.1% = 7.14				DL 5% = 7.08 DL 1% = 9.49 DL 0.1% = 12.53				DL 5% =6.73 DL 1% =9.03 DL 0.1% =11.91			

Figure 4. Graphic representation of the variant for the angle size characteristic compared to the control

Comparative analysis of ampelometric descriptors (length of veins N1, N2, N3, N4 and size of angles α, β, γ) represented an important stage in evaluating the authenticity of the studied variety.

Positive differences in leaf size and angle size, compared to the control, recorded for the elites H4, H6, H8, and H9, reveal that for these, the growth is greater, resulting in an average shoot length of over 150 cm, with good cord maturity (90%).

The leaf blade performs functions of particular importance for the plant, therefore in the case of these four elites, the recorded differences had positive effects on grape quality, as they were well-developed, uniform, with an average weight of 92 g, sugar content was 204 g/l, and acidity was 4.8 g/l H_2SO_4. Yields in this case were both qualitative and quantitative, averaging 3 kg/bunch.

Correlating these traits with the analysis of the variability of ampelometric characters, in the case of elites H4, H6, H8, and H9, it emerges that these can constitute new biotypes and can be studied further for the evaluation of agrobiological traits.

Considering the comparative study for elites H1, H3, and H7 as a whole, the recorded differences are insignificant compared to the control, the growths were within normal limits, and grape quality was superior, therefore these elites constitute the basis for multiplication and maintenance of the authenticity of the 'Pinot Gris' variety.

The coefficient of variation did not exceed the threshold of 30%, all samples fell within the limits of homogeneity, being representative of the individuals included in the study.

CONCLUSIONS

The biometric data, upon which the corresponding grades were given, reveal significant differences among the studied elites regarding the size and shape of the leaf, given by the length of the main veins N1, N2, N3, N4, the length L and the width l of the lamina, the size of the main angles α, β, γ between the main veins, justifying the choice of leaves as the main morphological and ampelographic characteristic for the identification and description of grapevine varieties.

The proposed descriptors support the differentiation of very similar varieties in terms of other characteristics or the identification of new biotypes.

Analysing and correlating the statistical data for the 'Pinot Gris' variety, it can be concluded that out of the 10 studied elites, only four could constitute new biotypes, namely, H4, H8, H6, and H9, which present clear differences compared to the control variety.

Differences in the size and shape of the leaves as well as the size of the angles reveal that for these elites, the growth is greater, resulting in an average shoot length of over 150 cm, with good cord maturity (90%). Implicitly, the quality of the grapes is superior, and the yields are both qualitative and quantitative, averaging 9-13 kg/ha.

The studied elites demonstrate good adaptability to current climate changes, making them suitable for cultivation in the Dobrogea region.

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