MORPHOMETRIC ANALISYS OF LEAF AMPELOGRAPHIC INFORMATION

Introduction

Present science of classification, systematization and description of vine genotype according to phenotype comes to third new level of ampelography – **interactive ampelography** which use up-to-date achievements of multimedia technics and computing aids for processing and analysis of collected information. So long as grown leaf is attached the major importance among many descriptive characteristics as an integral fragment of sort's «passport». We propose to use an invention of firm SIAMS, particularly the analyser SIAMS MesoPlant[18] for taking digital information from leaves.

SIAMS Mesoplant has a modular structure and consists of a digital darkroom SIAMS Photolab (instrumental platform) and a set of ready-made solutions [19]. In this case it is used the solution «Parameters of plant leaves».

Obtained information on 20 linear and angular parameters of leaf, according to codes of descriptor of International vine and wine organisation [12], is entered the Excel table and analyzed with biometrical methods [2, 14-15, 20-21].

As it is known, applied part of botanic – **ampelography**, 350-year of which is celebrated by viticulturists of all the world this year, is divided into two parts [4, 6, 11, 20]:

- general with tasks: study systematic of grape family *Vitaceae (Lindley) Juss;* research the issues of origin; heredity and spreading of its components; establishing patterns of variability of characteristics and properties of the genera, subgenus, species, subspecies, ecologi-geographical groups and subgroups, populations, varieties, clones and vine forms representatives under the influence of biotic, abiotic and anthropogenic environmental factors; working out of methodologies and technics of ampelographical researches;

- particular with tasks: description of botanic genotypes – varieties, clones and forms of vine, their ampelographical, phenological, agrobiological, uvological, biochemical, physiological, technical and economic characteristics (http://www.vitis.ru/pubs.asp?r=1&s=dpub&d=desc).

Scientists have identified the **third part of ampelography – ampelometric,** included special measurements of quantitative indexes studied parts of grape plant and/or its sort features with defining the degree of their variation on the bases of biometric methods [16]. And with appearance of the digital darkroom SIAMS Photolab [19] it is eliminated difficulties with gaining, reading and analysis of ampelographyc information.

So during identification of interested genotype, leaves are scanned, image data is put into computer then automatically it is measured their linear and angular parameters (leaf area and perimeter, footstalk length, lamina length and width, alpha angels, beta, gamma and other features). Finding data is written into electronic worksheet (example Microsoft Excel or Open office Calc), processed with biometric analysis method and compared to earlier received computer data of etalons or cyntypes.

Interactive ampelography (engl. interactive — communication with each other) – a new perspective direction of ampelometry, suggested by author, in which these specimen and their names are identified on the bases of system effect arising in Internet-system because of nonlocal experts communication, supplied with necessary instruments, and users who have information about phonotypical and genotypic features of grape specimen. It is expected to set up international Internet-community of experts, researches and users of interactive ampelography, for this purpose planning September symposium is consider its founder and participants to be active contributors. On initial stage of development of this community it is supposed off-line communication between its participants by different means of internet (e-mail, ICQ, Skype, web-forum or social nets etc.). In perspective it is planned to create intellectual

ampelographical portal with data bases of common use and based on them international automatic on-line consulting ampelographical service, created, supported and developed by experts, developers and researches of international ampelographical Internet-community. It is supposed that information received from experts and users will be processed real-time, the degree of its formalization and readiness for using will increase to the level of knowledge (new or earlier known to science). Consequently, interactive system provides advantages as in ampelography development so in its using, increase operability and validity of their decisions.

Possibility of using resources of international Internet-community of experts, researches and users of interactive ampelography will create and activate qualitative new conditions and in study process of students, bachelors and masters, postgraduate students and doctorates, preparing new high qualified staff of researches, theoretics and practitioner in ampelography.

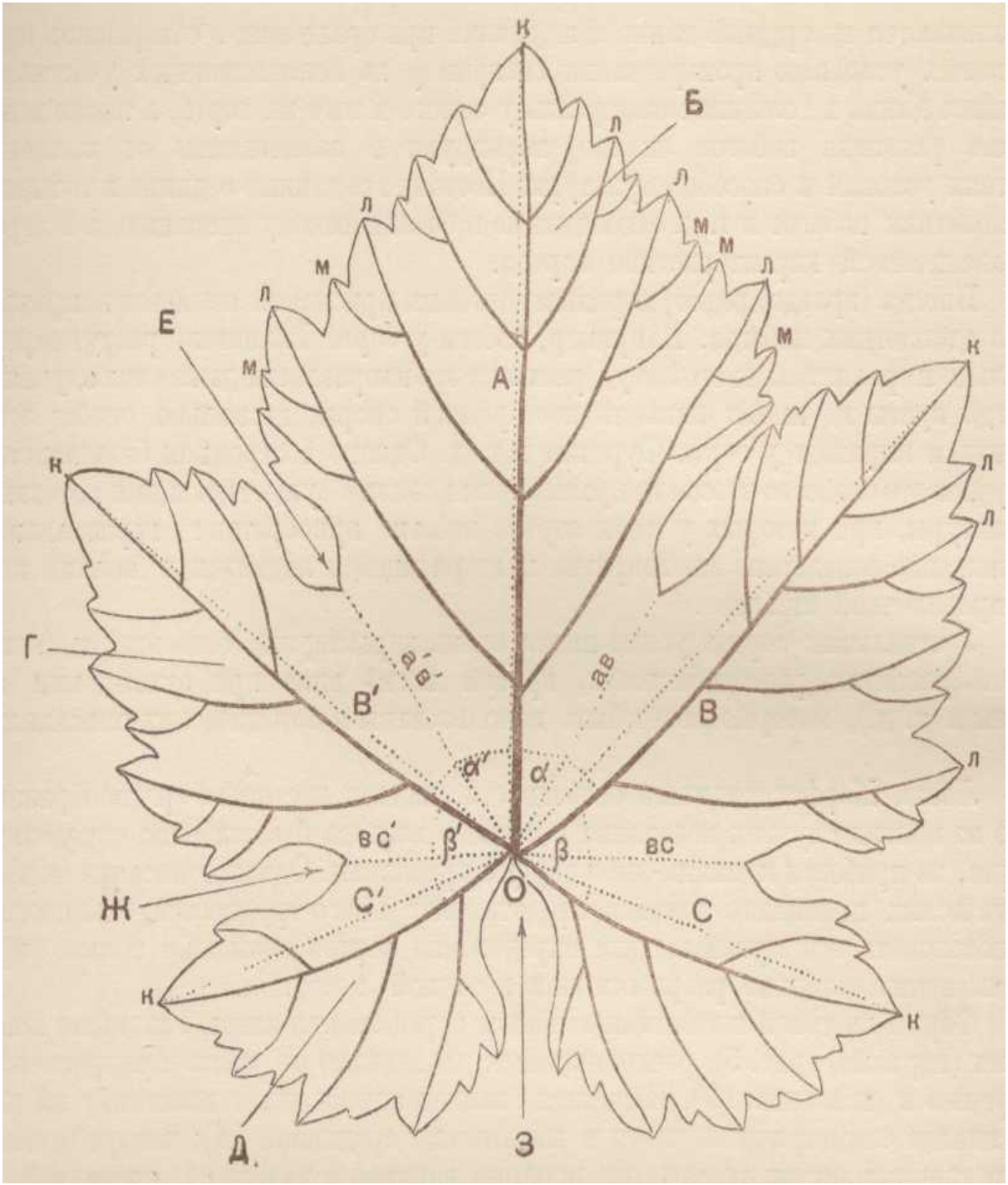
Material and methods

The material for research is plant specimens of grape genotypes on phenotype refered to different taxons of family *Vitaceae Juss.* [11].

In spite of readiness the systematic of Grape family by the instrumentality of molecular-genetic methods, it is still not fully explored the area of leaves morphometry, rather convenient for practical use of recognized specimens and related to different syntypes and taxons.

For this purpose firstly, it is attracted well known descriptor OIV [12].

In this paper gathering of information from grown leaves by scanner is made according to stated below 20 descriptive features, coded by numbers 065-1, 065-2, 093, 601-619 (picture 1-2) [3, 12-13 with our additions], and according to program SIAMS Photolab [19] put into Excel-table.



Picture. 1. Leaf of vine:

А — mid rib; *В*, B^1 — upper pair of main ribs; *С*, C^1 — lower pair of main ribs; *Б* — mid (terminal) lobe; *Г* — upper lateral lobe; *Д* — lower lateral lobe; *Е* — upper lateral hilum; *Ж* — lower lateral hilum; *З* — footstalk vallecula; α, α^1, β, β^1 — nervation angles; *к* — serration on the lobes; *л* — serration; *м* — additional serration [3].

Picture. 2. Linear and angular parameters of grown leaf [13, with our additions]:

SIAMS Photolab is a digital darkroom developed by company SIAMS – with electronic worksheet for work with images of flatbed scan. The product intends for images processing per chain of operations produced by user, making decisions on images processing and analysis. It contains instruments for visualization and frame grabber, calibration of entry system, instruments for interactive measuring of linear sizes and planimetric characteristics of the object, creation of adjoining eyeshot panorama, making of focused image on series of unfocused, making of image atlases, batch processing of images, and also instrumental templates for working out user's own analysis methodics [19].

SIAMS Photolab contains a number of major modules, some of them are given below:

- module "Worksheet" make own chain of images processing operations,
- measure parameters of selected objects on the images per module "Measuring objects",
- on the bases of module "Measuring angles and lengths" measure angles and lengths of polylines on the image.

The operating instruction is attached to the digital darkroom.

Our task: according to results of measuring of ampelographical quantitative features of leaves of wild lianas Damanka-1, Damanka-2 and Damanka-3 (further – and other North-Caucasus [9]), since olden time it have been growing diffused around the village Damanka of Krimskiy district Krasnodar region, it is defined their morphological identity with morphotypicalness *ssp. Vitis vinifera silvestris Gmel.* (picture 3, table 1).

Picture 3. Location of village Damanka of Krimskiy district Krasnodar region [17].

Table 1. – Fragment of initial data of interactive measurements of 20 leaves parameters one of three damansk lianas, 2009.
(measurements are made by student A. Milovanov).

Features																			
065-1	065-2	092	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	618	619
8,5	7,9	5,0	7,9	8,9	4,0	1,5	5,9	3,5	54,9	56,3	43,1	59,1	0,3	0,5	1,1	0,6	1,2	3,6	2,2
12	11,3	9,2	9,0	9,7	6,0	3,8	6,2	5,1	54,6	57,4	43,0	59,8	2,2	0,6	1,4	0,7	1,0	2,4	4,4
4,8	6,4	2,4	4,5	4,0	3,7	1,6	4,0	3,5	34,3	45,0	28,4	34,9	1,0	0,6	0,6	0,5	0,7	3,3	2,4
7,3	8,8	3,7	5,9	7,0	4,6	2,2	3,8	4,2	44,6	45,7	48,9	54,4	1,3	0,9	0,6	0,6	1,1	3,1	2,9
9,4	11,3	4,1	8,7	8,8	6,4	3,2	6,4	5,7	28,6	41,3	51,9	42,7	2,3	0,7	0,7	0,6	0,9	5,8	4,0
9,8	10,3	5,7	9,3	8,7	5,4	2,9	5,5	4,8	34,2	36,7	35,5	38,7	2,2	0,9	0,8	0,5	0,8	5,9	4,0
9,2	11,4	4,1	8,7	9,0	6,5	2,9	6,4	5,6	28,3	35,7	38,8	28,8	2,4	0,7	0,7	0,8	0,8	5,9	3,6
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…
12,9	10,2	6,7	11,6	10,1	6,1	2,4	7,3	5,5	33,1	42,0	42,7	30,0	1,5	1,0	1,1	0,7	0,6	5,2	4,0

Biometric analysis of measure data was made according to created by O.V. Adibekov program Data Pilot, Russian version of which is accessible on internet site [14], English version – address [15] (picture 4-9).

Picture 4. Liana Damanka-1.

Picture 5. Leaves of liana Damanka-1.

Picture 6. Liana Damanka-2.

Picture 7. Liana Damanka-3.

Picture 8-9. Leaves of liana Danamka-2 and Damanka-3.

Research results

Results of biometrical data analysis of interactive measurements of leaves three lianas of Krimskiy district Damanka-1, Damanka-2 and Damanka-3 are

shown in tables 2 and 3.

Table 2. – Variational data analysis of interactive measurements of leaves three damansk lianas, 2009.

Parameters and statistic	Features									
	65-1	65-2	092	601	602	603	604	605	606	607
Damanka-1										
Medium	10,24	10,51	5,23	8,94	8,57	5,72	2,91	6,08	5,25	37,02
Standard mistake of medium	0,62	0,55	0,40	0,56	0,44	0,29	0,21	0,34	0,35	1,35
Interval	14,22	12,76	7,83	12,60	11,58	6,65	4,49	7,69	9,42	26,61
Minimum	4,84	6,44	1,87	3,95	3,98	3,59	1,48	3,83	2,96	28,29
Maximum	19,06	19,20	9,70	16,55	15,55	10,24	5,97	11,52	12,37	54,90
CV	32,2	27,5	40,5	32,9	27,3	26,5	37,8	29,7	35,7	19,4
d - difference 1 - 2	0,97	2,26	0,73	1,26	0,95	1,50	0,61	1,51	1,65	3,58
t – criteria of student	1,31	3,40	1,59	1,92	1,66	4,36	2,66	3,59	4,20	1,96
Damanka-2										
Medium	9,27	8,24	4,49	7,68	7,62	4,22	2,30	4,56	3,60	40,61
Standard mistake of medium	0,39	0,38	0,23	0,36	0,36	0,19	0,10	0,25	0,17	1,22
Interval	11,98	9,44	5,92	9,55	9,60	5,14	2,67	7,55	5,35	36,53
Minimum	3,38	4,40	1,67	2,96	3,90	2,01	1,12	0,85	0,83	24,67
Maximum	15,36	13,84	7,60	12,51	13,50	7,14	3,79	8,41	6,18	61,20
CV	27,8	30,4	34,0	30,4	31,2	30,0	28,6	35,6	30,7	19,8
d - difference 2 - 3	0,56	0,89	0,80	0,18	0,42	0,55	0,45	1,35	0,73	0,19
t - criteria of student	1,18	1,82	2,83	0,44	1,00	2,24	3,05	4,26	3,17	0,13
Damanka -3										
Medium	9,83	9,14	5,30	7,86	8,04	4,77	2,75	5,92	4,32	40,8
Standard mistake of medium	0,26	0,31	0,16	0,23	0,21	0,15	0,11	0,20	0,16	0,75
Interval	6,24	7,53	4,32	5,22	4,96	3,40	2,62	4,28	3,38	20,93
Minimum	6,88	5,37	2,91	5,26	5,41	3,10	1,43	3,68	2,66	32,03
Maximum	13,12	12,90	7,22	10,48	10,36	6,50	4,05	7,95	6,04	52,97
CV	15,6	20,2	18,4	17,2	16,0	19,1	23,9	20,0	21,6	11,0
d - difference 1 - 3	0,41	1,37	0,17	1,08	0,53	0,96	0,16	0,16	0,92	3,77
t - criteria of student	0,61	2,19	0,15	1,80	1,08	2,95	0,68	0,41	2,38	2,44
Parameters and statistic	Features									
	608	609	610	611	612	613	614	615	618	619
Damanka-1										
Medium	40,96	40,85	39,14	1,85	0,67	0,80	0,57	0,86	4,82	3,88
Standard mistake of medium	1,33	1,28	1,76	0,15	0,03	0,04	0,03	0,04	0,32	0,23
Interval	27,30	27,89	33,80	3,45	0,70	0,88	0,66	1,09	7,91	5,16

Minimum	30,12	28,43	25,97	0,30	0,28	0,49	0,28	0,45	0,82	2,20
Maximum	57,42	56,33	59,77	3,75	0,98	1,37	0,94	1,54	8,73	7,36
CV	17,2	16,6	23,8	42,2	23,1	28,5	26,4	26,6	35,6	31,5
d - difference 1 - 2	7,39	1,49	12,31	0,38	0,03	0,00	0,08	0,16	2,36	0,89
t - criteria of student	4,18	0,89	4,35	2,24	0,71	0,05	2,12	2,99	6,23	3,47
Damanka-2										
Medium	48,35	42,34	51,45	1,48	0,64	0,81	0,49	0,71	2,45	2,99
Standard mistake of medium	1,16	1,09	2,21	0,08	0,04	0,04	0,02	0,03	0,20	0,11
Interval	41,86	30,87	63,98	2,89	1,34	1,27	0,65	0,81	6,15	3,06
Minimum	21,74	28,87	26,6	0,31	0,19	0,37	0,15	0,27	0,34	1,66
Maximum	63,60	59,74	90,58	3,20	1,53	1,65	0,80	1,08	6,49	4,72
CV	15,8	16,8	28,2	36,0	36,2	34,3	29,1	25,4	53,0	25,1
d - difference 2 - 3	0,44	2,45	6,28	1,28	0,04	0,00	0,03	0,00	0,33	0,46
t - criteria of student	0,24	1,31	2,13	0,54	0,94	0,08	0,97	0,26	1,19	2,7
Damanka-3										
Medium	47,92	39,89	57,73	1,54	0,60	0,81	0,53	0,70	2,78	3,45
Standard mistake of medium	1,35	1,52	1,94	0,07	0,03	0,04	0,02	0,03	0,19	0,13
Interval	30,44	41,27	48,65	1,91	0,70	0,80	0,49	0,54	4,60	2,65
Minimum	33,35	24,01	40,97	0,62	0,30	0,46	0,30	0,47	0,30	2,09
Maximum	63,79	65,28	89,62	2,53	1,00	1,27	0,79	1,01	4,90	4,74
CV	16,8	22,9	20,2	28,7	29,8	26,8	27,3	23,2	41,2	21,9
d - difference 1 - 3	6,95	0,96	18,59	0,32	0,08	0,00	0,05	0,16	2,04	0,44
t - criteria of student	3,67	0,48	7,10	1,93	1,81	0,14	1,21	3,19	5,42	1,66

According to submitted data:

- coefficient of features variation exceeds luminal – it is evidence of absence of their normal distribution [2],

- three compared damansk lianas were characterized according to 10 (Damanka-1 и Damanka-2), 5 (Damanka-1 and Damanka-3) and 5 (Damanka-2 and Damanka-3) features differences from 20 measured;

- it arouses to use modern nonparametric bootstrep-method analysis (table 3) [1, 5, 8, 10].

Table 3. – Bootstrep assessment of different damansk lianas on 20 leaves' morphological features, 2009.

Lianas	Features									
	065-1		065-2		092		601		602	
	D2*	D3*	D2	D3	D2	D3	D2	D3	D2	D3

Damanka-1	0,91	0,73	1,00	0,99	0,95	0,43	0,98	0,97	0,95	0,86
Damanka-2		0,12		0,03		0,00		0,32		0,16
	603		604		605		606		607	
	D2	D3	D2	D3	D2	D3	D2	D3	D2	D3
Damanka-1	1,00	1,00	1,00	0,75	1,00	0,65	1,00	1,00	0,03	0,01
Damanka-2		0,01		0,00		0,00		0,00		0,44
	608		609		610		611		612	
	D2	D3	D2	D3	D2	D3	D2	D3	D2	D3
Damanka-1	0,00	0,00	0,18	0,69	0,00	0,00	0,99	0,98	0,77	0,97
Damanka-2		0,60		0,91		0,02		0,29		0,83
	613		614		615		618		619	
	D2	D3	D2	D3	D2	D3	D2	D3	D2	D3
Damanka-1	0,48	0,44	0,99	0,89	1,00	1,00	1,00	1,00	1,00	0,96
Damanka-2		0,46		0,16		0,60		0,11		0,00

D2* - Damanka-2, D3* - Damanka-3

Comparison of results of 20 features measurements shows that there are not differences between average only in 24 cases of 60: 60% cases of differences in their average meanings – the way to attract multidimentional analysis method.

The method d_0 [7, 16] is used for determination of morphological leaves similarity of studied lianas of wild growing grape. In table 4 below it is shown quantitative leaves' characteristics according to their average 10 parameters of the first features set: from linear feature 065-1 to angular 608. Results of comparing average data on 10 leaves' parameters of 46 North-Caucasus lianas with 60 etalon herbarium leaves showed in table 5.

Table 4. – Characteristics of studied North-Caucasus lianas on 10 linear and angular leaves' features.

Lianas	Number of leaves	Features									
		065-1	065-2	092	601	602	603	605	606	607	608
1	10	9,11	10,02	4,94	8,15	7,13	5,11	5,04	4,87	40,70	43,44
2	18	8,34	7,84	3,37	6,44	5,79	3,85	4,55	3,43	43,79	53,04
3	14	9,37	8,55	3,68	7,23	6,13	4,34	5,24	3,97	49,15	49,98
4	28	10,24	10,51	5,23	8,94	8,57	5,72	6,08	5,25	37,02	40,96
5	43	9,27	8,24	4,49	7,68	7,62	4,22	4,56	3,60	40,61	48,35
6	36	9,83	9,14	5,30	7,86	8,04	4,77	5,92	4,32	40,80	47,92
7	24	8,11	7,73	3,20	7,18	5,05	4,66	4,01	3,53	36,02	45,90
8	47	12,45	10,87	5,01	10,86	9,60	6,00	7,27	5,40	29,26	39,64

9	37	12,62	11,47	6,11	10,34	9,91	6,09	7,16	5,45	34,45	45,81
10	40	9,78	9,14	5,60	8,29	7,63	4,75	4,74	4,22	36,40	43,95
11	36	13,26	11,33	6,00	11,29	10,05	6,06	7,49	5,46	30,09	39,49
12	35	15,35	12,19	5,99	12,16	11,10	6,14	7,30	5,50	38,31	53,25
13	4	16,81	14,93	7,41	12,95	13,47	7,87	8,74	6,79	31,85	53,65
14	36	13,19	10,73	5,08	10,82	9,86	5,58	5,51	4,52	34,92	49,46
15	20	12,40	11,73	6,11	10,48	9,00	6,17	7,52	5,74	35,51	40,31
16	24	9,42	8,33	5,00	7,89	6,10	4,35	5,39	4,01	35,62	47,45
17	37	12,44	11,58	10,24	10,56	8,57	6,23	7,30	5,59	34,02	43,43
18	20	11,81	11,20	7,46	10,24	9,05	6,16	7,35	5,79	33,11	38,84
19	26	9,00	8,68	4,67	7,49	6,73	4,72	5,34	4,20	30,75	42,33
20	30	12,80	10,69	6,01	10,10	8,63	5,62	6,88	5,12	38,77	54,55
21	22	14,91	13,15	10,94	12,26	9,96	6,87	8,04	6,26	35,58	45,44
22	42	9,27	8,34	4,19	7,54	6,12	4,32	4,70	3,81	41,68	51,26
23	40	9,32	9,69	5,01	8,38	7,44	5,10	5,80	4,51	35,01	40,71
24	5	19,40	17,05	9,81	16,07	13,19	8,63	10,67	7,55	44,76	56,67
25	15	9,59	9,30	4,61	7,84	6,71	4,66	5,24	4,24	42,93	46,87
26	14	7,50	7,77	3,79	5,85	5,67	4,30	4,51	3,48	43,25	50,18
27	40	7,16	7,16	4,29	5,91	5,57	3,61	4,61	3,44	41,46	48,99
28	45	5,93	5,37	1,05	4,12	5,79	1,24	8,22	7,91	40,37	47,76
29	36	7,68	7,20	3,61	6,02	5,36	3,52	4,79	3,41	44,65	48,27
30	26	7,74	7,14	4,34	5,82	5,36	3,74	4,09	3,27	45,37	52,05
31	36	9,60	8,34	4,90	7,05	6,55	4,43	4,91	3,84	47,14	54,31
32	34	9,70	8,73	4,42	7,43	6,43	4,44	4,80	4,09	46,12	46,59
33	15	9,01	9,74	4,47	7,84	7,22	5,06	6,32	4,68	37,12	42,85
34	15	6,72	7,01	3,67	5,58	5,39	3,73	4,67	3,44	38,56	47,10
35	31	7,94	8,40	3,82	6,76	5,85	4,44	5,15	4,12	39,20	46,14
36	15	6,72	7,01	3,67	5,58	5,39	3,73	4,67	3,44	38,56	47,10
37	15	8,22	8,56	3,60	6,95	6,31	4,50	5,25	4,09	38,56	45,17
38	31	7,94	8,40	3,82	6,76	5,85	4,44	5,15	4,12	39,20	46,14
39	15	9,01	9,74	4,47	7,84	7,22	5,06	6,32	4,68	37,12	42,85
40	30	9,11	9,67	4,81	7,96	7,25	5,10	6,48	4,75	37,12	42,85
41	20	13,81	12,54	7,29	11,58	10,01	6,69	7,63	6,12	39,04	43,90
42	40	12,78	12,02	7,60	10,55	10,55	6,10	7,47	5,42	38,26	47,37
43	21	8,07	7,54	4,22	6,68	5,97	3,93	3,50	3,46	38,35	45,24
44	21	10,69	9,61	4,09	8,48	7,74	5,05	5,73	4,72	43,41	50,85
45	15	8,51	8,60	3,67	6,71	6,40	4,30	4,60	4,12	43,50	45,11
46	31	9,44	8,73	3,88	7,47	6,23	4,41	5,22	4,18	40,92	51,38
Etalon	60	8,17	7,68	5,12	6,46	5,62	3,72	3,26	2,94	40,99	47,71

Comments: liana 1 - Damanka-1, 2008; liana 2 - Damanka-2, 2008; liana 3 - Damanka-3, 2008; liana 4 - Damanka-4, 2009; liana 5 - Damanka-5, 2009; liana 6 - Damanka-6, 2009; liana 7 – Abinskaya-0, 2008; liana 8 – Abinskaya-1, 2009; liana 9 – Abinskaya-2, 2009; liana 10 – Abinskaya-3, 2009; liana 11 – Abinskaya-4, 2009; liana 12 – Abinskaya-5, 2009; liana 13 – Abinskaya-6, 2009; liana 14 – Abinskaya-7, 2009; liana 15 – Abinskaya-8, 2010; liana 16 – Abinskaya-9, 2010; liana 17 – Abinskaya-10, 2010; liana 18

– Abinskaya -11, 2010; liana 19 – Abinskaya -12, 2010; liana 20 – Abinskaya 13, 2010; liana 21 – Abinskaya -14, 2010; liana 22 – Abinskaya -15, 2010; liana 23 – Abinskaya -16, 2010; liana 24 – Maykop-1, 2005; liana 25 – Maykop-2, 2005; liana 26 – Maykop-3, 2006; liana 27 – Maykop-4, 2009; liana 28 – Maykop-5, 2009; liana 29 – Maykop-6, 2009; liana 30 – Maykop-7, 2009; liana 31 – Maykop-8, 2009; liana 32 – Maykop-9, 2009; liana 33 – Maykop-10, 2010; liana 34 – Maykop-11, 2010; liana 35 – Maykop-12, 2010; liana 36 – Maykop-13, 2010; liana 37 – Maykop-14, 2010; liana 38 – Maykop-15, 2010; liana 39 – Maykop-16, 2010; liana 40 – Maykop-17, 2010; liana 41 – Goryachiy Kluch -0, 2006; liana 42 – Goryachiy Kluch-1, 2009; liana 43 – Khocta-1, 2005; liana 44 – Khosta-2, 2005; liana 45 – Khosta-3, 2005; liana 46 – Dagestan-A, 2006; as etalon *ssp. Vitis vinifera silvestris Gmel.* it was taken 60 leaves from 3 state herbariums: 21 leaves of Main botanic garden (I.T.Vasilchenko and so on), 21 leaves of State Nikitskiy botanic garden (V.N.Golubev, V.Kosikh and so on) and 18 leaves from Kubanskiy State Agrarian University (I.S.Kosenko, S.S.Chukuridi and so on).

Table 5. – Differentiation of grape lianas according to complex of the first set of 10 morphological features.

Ranged distances							
43	10	25	2	45	46	22	29
19	16	23	27	32	14	37	30
21	35	38	5	12	34	36	33
39	42	9	1	15	17	40	6
3	20	31	11	26	44	41	18
	4	8	13	7	24	28	
Indicator of typicalness d_0							
1.021	1.113	1.133	1.218	1.249	1.344	1.412	1.430
1.439	1.446	1.463	1.482	1.498	1.499	1.531	1.536
1.552	1.587	1.587	1.648	1.649	1.668	1.668	1.671
1.671	1.671	1.682	1.690	1.725	1.742	1.814	1.827
1.862	1.883	1.909	1.915	1.920	1.935	1.980	2.044
	2.091	2.248	2.313	2.370	2.521	2.692	

According to results of calculation typicalness indicator d_0 (table 5), the highest similarity with 60 etalon herbarium leaves *Vitis vinifera silvestris Gmel.* at the first set of 10 morphological features (065-1, 065-2, 092, 601, 602, 603, 605, 606, 607 и 608) have shown lianas 43 (Khosta-1, d_0 = 1,021), 10 (Abinskaya -3, d_0 = 1,113), 25 (Maykop -2, d_0 = 1,133), 02 (Damanka -2, d_0 = 1,218), 45 (Khosta -3, d_0 = 1,249), 46 (Dagestan-A, d_0 = 1,344) and the most atypical – lianas 28 (Maykop-5, d_0 = 2,692), 24 (Maykop-1, d_0 = 2,521), 07 (Abinskaya-0, d_0 = 2,370), 13 (Abinskaya-6, d_0 = 2,313), 08 (Abinskaya-1, d_0 = 2,248), 04 (Damanka-4, d_0 = 2,091) and so on. And according to the first set of

features last mentioned lianas excel the first in typicalness indicators more than twice at that.

Calculations of typicalness indicator d_0 on the second set of morphometrical features are shown in table 6.

Table 6. – Differentiation of grape lianas on complex of the second block of 10 morphological features.

Ranged distances							
31	42	25	32	30	29	27	9
5	6	10	1	16	20	18	26
3	45	22	41	23	4	12	33
39	8	21	15	35	38	19	43
44	40	11	34	36	46	37	2
17	13	14	7	24	28		
Indicator of typicalness d_0							
0.800	1.181	1.209	1.217	1.221	1.246	1.280	1.321
1.333	1.380	1.386	1.391	1.410	1.469	1.527	1.533
1.537	1.540	1.596	1.632	1.634	1.652	1.666	1.668
1.668	1.696	1.706	1.711	1.712	1.712	1.713	1.769
1.772	1.798	1.811	1.865	1.865	1.883	1.905	1.922
	1.941	2.244	2.266	2.392	2.463	2.550	

When comparing results of interactive measuring of leaves the same lianas on the second set of ten features (604, 609-615, 618-619) (table 6) it was ascertained that the most identical to herbarium leaves examples are lianas 31 (Maykop-8, d_0 = 0,800), 42 (Goryachiy Kluch -1, d_0 = 1,181), 25 (Maykop -2, d_0 = 1,209), 32 (Maykop-9, d_0 = 1,217) and others, less identical – lianas 28 (Maykop-5, d_0 = 2,550), 24 (Maykop-1, d_0 = 2,463), 07 (Abinskaya -0, d_0 = 2,392), 14 (abinskaya-7, d_0 = 2,266), 13 (Abinskaya -6, d_0 = 2,244), 17 (Abinskaya-10, d_0 = 1,941) and so on. Hence it appears, according to the second set of the following 10 features typicalness indicators d_0 of last lianas excel the first three times.

Conclusions and recommendations

Selection of leaves by hand or interactive measuring methods is not significantly different: for examination of the botanic question about belonging of lianas to one eco- or biotype they should be unified.

There were not clear differences on morphometrical leaves' features between three damansk lianas as in 2008 so in 2009.

Solution of botanic question about referring of damansk lianas, as others, to ampelographical taxon *ssp. Vitis vinifera silvestris Gmel.* was held by using multidimentional analysis method d_0. As a result the most similar to threeherbarium leaves' etalon on complex of 20 morphometrical features are lianas 25 (Maykop-2) and 29 (Maykop-6), less identical – lianas 28 (Maykop-5), 24 (Maykop-1), 07 (Abinskaya-0) and 13 (Abinskaya-6).

List of literature

1. .