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The use of automated system-cognitive analysis (ASC-analysis) and the intelligent system "Aidos" for identifying genotypes *Actinidia deliciosa* (kiwi) on the outer contour of the leaf

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Abstract. The content of this publication reveals the results of the selection and selection of options for solving tasks regarding selection and varietalization of kiwi (*Actinidia deliciosa*). The “tool” is identified by individual varieties according to the leaves available in the leaf contours, because in their form the information data characterizing the variety (on the phenotype and genotype) are stored in their form. In the context of this research work, an analysis of the signs of the morphological order was carried out, which are inherent in kiwi leaves on the sheet circuit. For this, a system called “Aidos” was used, and the targets were the establishment of (indirect) gender of kiwi plants and the identification of varieties based on the contour of the leaves. The information obtained using the ASC-complex (automated system-cognitive analysis) and the “Aidos” smart system, into which the scanned leaves of leaves, was loaded with it, are disclosed. A evaluative procedure was performed using the quantitative method of the relative sheet circuit of 10 varieties of kiwi. According to the information received, class samples of analyzed genotypes based on the sheet configuration were compiled systematizing. The effect of the characteristic values of the genotypic nature in the most accurate INF4-model of the second iteration in the conditions of the integral order (“sum of knowledge”). Clastorization of the cognitive nature of classes made it possible to differentiate four key cluster structures consisting of subcategories, allocated according to the quantitative features of determinants of the sheet circuit.

1 Introduction

The study of the leaf parameters of culture allows you to identify the mechanisms of plant adaptation to the action of abiotic environmental factors, use these indicators for anatomical and morphological identification that characterize the biological features of the variety, and, based on this, to distinguish the most promising in productivity and plasticity of the variety.

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An important diagnostic sign associated with the photosynthetic activity of plants is the surface area of the sheet [1-4]. It was revealed that (kiwi) has the largest area of the sheet surface and at the same time significantly smaller - the Monti, Bruno and Tomuri varieties [1].

In addition to the area characteristic of the leaf, the variability of the leaf acts as an indicator of the diagnostic order in the course of disclosure and identification of specific features of the variety sample from the standpoint of biology, taking into account the climatic conditions present during cultivation. This circumstance determines the variability that is morphological. In the vast majority of cases, plant crops with extensive eco-plasticity (increased variability of the area inherent in the sheet) can more successfully and quickly adapt to the dynamic environment, and are also characterized by more favorable prospects if the process of growing them proceeds under those conditions of the climate plan that are represented by limiting.

When performing a comparative analysis of retrospective information accumulated over many years of research, it is possible to formulate the conclusion according to which the changes in the characteristics from the category of “biological” in kiwi (*Actinidia deliciosa*) have a direct relationship with the factors from the category “climatic [4-6]. In particular, the personal dynamics, reflected in the form of a variable indicator-coefficient, suggests that the degree of variability of female cultures leaves varies from 5,2% to 7% in the spectrum. This value is smaller than the male varieties of Tomuri and Matua. At the same time, the latter is characterized by more significant variability.

Understanding the anatomy and morphology of the kiwi plant is crucial for the identification of senians of male and female kiwi. Male kiwi seedlings usually have larger leaves and form flowers with protruding stamens, while female kiwi seedlings have smaller leaves and form flowers with stigmas and ovaries. In addition, the differences in the anatomy and morphology of the leaves of kiwi and cherries of leaves can play a significant role in determining the floor [2].

So, three months after the buds of the kidneys, the area of leaves, both male and female plants of kiwi on autonomic and generative shoots, is 128,.6 ± 13,45 cm^2 in male plants and 104,5 ± 4,.02 cm^2 in female plants. The shape of the leaves was defined as “folium cordatum” (heart-shaped leaf) and “folium robundato-cordatum” (rounded heart-shaped leaf) (Fig. 1).

Fig. 1. The morphology of the sheet Actinidia deliciosa: A-the shape of a sheet of a male plant (folium rotundato-cordatum); B - the shape of a sheet of female plant (folium cordatum)

Fig. 2. Putically bifurcated leaves are observed both in male (A) and in female (B) plants

Higher values of the total thickness of female leaves (190 ± 3,84 microns) were evaluated compared to male leaves (174 ± 3,52 microns), which led to a thicker adaxial epidermis of the leaves and especially to a thicker, frequent parenchyma of female leaves (136 ± 2,76 μm compared with 104 ± 1,61 μm in men's leaves) [1, 2, 6]. Typically bifurcated leaves were observed both in male and female leaves (Fig. 2).

The purpose of our research was to study the morphological signs of kiwi leaves in the Aidos system along the outer contour of the sheet, both for identifying varieties on the leaves, and for indirect determination of plant flooring.

2 Objects and research methods

The objects of detailed analysis in the context of this research work were 10 kiwi varieties, which are included in the collection of the genetic type of FRC SSC RAS. Their primary information base (database) includes scan-signs of leaves. The instrumental base was the "Aidos" system complex (with open IR: http://lc.kubagro.ru/aidos/_aidos-x.htm) and ASC-analysis (ASCa). With the use of such modern means, opportunities are ensured on the formation and use of a measuring system [7-9].

First of all, it is advisable to indicate an indication of the fact that the leaves of the plant organism are characterized by the most significant convenience and accessibility as an object of appropriate survey, because their structure contains information data on the genome and other signs from the category of "phenotypical", depending on the exogenous environment and genotype.

The leaves that were selected for this study were subject to measurement, scan-processing and ASCa using "Aidos" [7-13]. Created scan shots are sent to separate folders. The names of which include information about the localization and varietal affiliation of the corresponding plant.

In all individual folders, there are scan-images of leaves taken from a separate bush. Their names include the name of the class/variety, the license plate of the sheet in the folder and directly on the bush. For the presented example, the scenaries of 210 leaves are used as part of the sample of the studying purpose.

For the digital transformation of scan-files, the module 2.3.2.4 is used. Its basis is the developed Bandyk D.K. on the production and algorithm prof. Lutsenko E.V. [10].

The module execution of its functions ensures the formation of a file in Excel format with a sample of the training purpose. The relevant information is displayed in the content of table 1. Here in the separate lines, six dozen shirts are revealed for the description, six hundred gradations and 10 variety/class options.

Among other things, it is compiled by a table with averaged information on individual class clusters. In automated mode, it sets the number of specified gradations and scales of the descriptive plan (numerical and text). When an exit to the formation of the model occurs, a full-fledged process of transferring the information of digital transformation of graphic files (scan-images) into the database present in the "Aidos" system complex is initiated. At the same time, the reference books of the corresponding gradations/scales are formed, the primary information is encoded and the event base (eventological) and the sample of the educational purpose are created.

Table 1. Excel file of training sample

1	Training set object	Class	X center of gravity	Y center of gravity	Area (px)	Average	Stand. dev.	000°	006°	012°	018°	024°	030°	036°	042°	048°	054°
2	Bruno1Bruno-001.jpg	Bruno	671,1913452	975,6136475	259579	283,062836	66,0021744	281,3089	269,8061	260,0591	254,9817	243,5134	243,3272	234,4964	234,1426	231,3616	226,0211
3	Bruno1Bruno-002.jpg	Bruno	657,1923828	942,3043213	288680	303,842255	33,7355804	328,3083	326,1583	319,3499	318,0106	318,622	313,9902	302,7944	300,911	293,1723	285,6761
4	Bruno1Bruno-003.jpg	Bruno	704,4587402	912,1463013	254680	283,072083	33,9420815	298,5415	293,6666	287,3441	291,5583	284,6815	286,0541	281,9756	281,0099	277,5021	274,8395
5	Bruno1Bruno-004.jpg	Bruno	691,6524658	924,248291	234450	271,4245	35,433754	288,3477	295,0075	287,7268	282,8062	284,463	279,322	284,5532	279,3854	279,4151	266,0411
6	Bruno1Bruno-005.jpg	Bruno	682,9888306	846,1014404	205079	254,321182	36,5024071	250,0115	244,8845	235,2559	228,7744	225,7833	219,0712	217,8672	221,1827	221,2107	218,7627
7	Bruno1Bruno-006.jpg	Bruno	624,2336426	888,3759766	237151	264,218079	79,7058411	329,267	305,4602	282,6272	258,1779	229,255	215,8066	209,6044	206,6572	203,8587	206,1915
8	Bruno1Bruno-007.jpg	Bruno	669,5418701	882,8215332	238614	272,132416	47,6757278	298,9582	297,5959	285,7593	285,5755	287,885	282,5466	280,0041	273,3978	269,8833	264,3567
9	Bruno2Bruno-001.jpg	Bruno	645,0968018	875,5839233	203317	254,122528	29,5062046	295,9032	298,0635	291,3427	294,9286	286,8147	272,0735	262,6013	252,6297	247,7247	246,9076
10	Bruno2Bruno-002.jpg	Bruno	685,538269	932,0678101	326788	321,916382	33,0456429	323,9617	319,7672	322,5883	319,6566	317,9948	311,7598	306,9552	307,9107	310,8074	311,3596
11	Bruno2Bruno-003.jpg	Bruno	655,8056641	926,2318726	277327	290,88205	69,8877029	332,1945	319,4839	302,8761	296,2652	288,1372	283,4792	281,6448	276,4579	271,5581	268,1707
12	Bruno2Bruno-004.jpg	Bruno	564,6627808	1047,776367	321077	377,046875	124,578682	297,8373	278,3754	261,7295	234,8792	215,7042	201,3423	183,2163	622,4261	560,1669	514,8459
13	Bruno2Bruno-005.jpg	Bruno	569,6842041	1034,594482	269046	372,520447	114,454651	335,816	314,0445	275,8549	246,9337	228,0941	209,4769	192,0173	173,6196	577,9781	531,3755
14	Bruno2Bruno-006.jpg	Bruno	595,4242554	872,1286621	346573	344,057526	61,5730896	401,0767	393,3109	396,8254	397,5407	387,6764	381,2897	370,7178	355,4135	354,0234	352,293
15	Bruno2Bruno-007.jpg	Bruno	676,4268188	1082,381958	360522	401,099457	113,118385	204,5732	190,194	178,4756	163,1253	151,1985	146,1746	461,4758	502,4891	513,8645	472,2934
16	Bruno3Bruno-001.jpg	Bruno	671,6092529	882,4838257	238560	272,242401	46,3340683	297,3907	295,5758	284,1926	279,6121	286,3877	280,6078	281,5456	269,337	271,5016	263,0825
17	Bruno3Bruno-002.jpg	Bruno	644,4608154	910,5549927	236466	260,086823	91,9398422	347,0395	330,9428	303,7393	274,0371	238,163	217,7522	212,2191	198,6006	194,3951	196,6131
18	Bruno3Bruno-003.jpg	Bruno	875,7536011	1067,214478	428723	367,431244	53,9851837	401,2465	401,4795	390,7936	377,2769	376,8316	377,3635	369,7025	364,3282	362,2127	355,5215
19	Bruno3Bruno-004.jpg	Bruno	837,0793457	1110,49353	471907	383,03772	66,6564484	401,421	395,6041	390,0321	385,4165	374,8468	366,6476	361,4814	353,2703	345,5093	333,5992
20	Bruno3Bruno-005.jpg	Bruno	828,7385254	1128,38855	416899	365,291229	52,8143806	349,762	351,7779	346,456	347,8267	346,975	344,1753	343,1078	342,2586	338,0482	333,2975
21	Bruno3Bruno-006.jpg	Bruno	844,9328613	1161,717896	460112	383,187958	42,9065628	353,5673	354,5328	361,4929	375,9997	387,3796	383,2873	387,1637	382,9608	378,0341	374,4193
22	Bruno3Bruno-007.jpg	Bruno	793,9055176	1080,923096	323962	318,985931	45,8848305	332,5945	329,467	325,7866	318,7219	307,8696	301,2204	296,8542	292,1991	287,961	277,5511
23	Kivaldi1Kivaldi-001.jpg	Kivaldi	826,5838013	1126,801636	416441	365,362946	52,0056038	352,9163	353,8767	349,6637	350,0573	350,7554	346,3342	345,7838	345,5914	342,1187	335,2601
24	Kivaldi1Kivaldi-002.jpg	Kivaldi	669,5418701	882,8215332	238614	272,132416	47,6757278	298,9582	297,5959	285,7593	285,5755	287,885	282,5466	280,0041	273,3978	269,8833	264,3567
25	Kivaldi1Kivaldi-003.jpg	Kivaldi	646,1553345	910,3487549	236567	260,940277	91,7498398	345,3453	329,1736	302,1257	278,5045	238,526	216,5713	211,8889	200,3779	194,0464	195,451
26	Kivaldi1Kivaldi-004.jpg	Kivaldi	878,7165527	1066,046753	428562	367,924225	52,7509727	400,7834	398,9952	388,3155	375,1527	374,6998	374,5644	370,6396	361,607	363,7744	354,2826
27	Kivaldi1Kivaldi-005.jpg	Kivaldi	833,1606445	1109,603149	471633	383,630951	66,7503204	405,8394	399,5949	394,0503	389,4183	378,2825	370,1207	368,4461	356,6673	347,4917	333,4627
28	Kivaldi1Kivaldi-006.jpg	Kivaldi	841,581665	1158,394531	459977	383,279877	41,8332405	356,9189	358,894	365,4311	379,5959	390,979	387,5337	391,9389	387,6751	383,4521	379,1882
29	Kivaldi1Kivaldi-007.jpg	Kivaldi	791,2106323	1082,829468	323387	318,59079	47,4207802	335,2894	332,1566	327,4637	319,0913	310,1159	301,1855	296,6627	292,7414	284,2964	276,0513
30	Kivaldi2Kivaldi-001.jpg	Kivaldi	680,1882324	1227,097046	286049	292,546936	88,768959	296,3131	285,88	279,971	270,6456	262,7643	253,3812	247,1169	235,2336	222,4929	215,0465
31	Kivaldi2Kivaldi-002.jpg	Kivaldi	926,2781982	2199,415039	273715	290,757904	65,5631104	375,2223	377,3041	383,7777	394,7385	410,9454	433,7449	433,6751	380,7886	342,6106	314,9452
32	Kivaldi2Kivaldi-003.jpg	Kivaldi	987,5874634	2229,269531	239297	273,825409	34,2052307	289,9135	291,5367	296,4117	304,9969	317,615	334,937	358,4084	336,0586	302,8194	278,2668
33	Kivaldi2Kivaldi-004.jpg	Kivaldi	931,2012939	2227,911865	279870	294,17099	49,6016808	336,2987	338,2295	343,9382	353,859	368,2706	388,7881	385,4356	337,9973	304,7558	279,5929
34	Kivaldi2Kivaldi-005.jpg	Kivaldi	924,1287842	2217,936523	281812	298,324707	65,4239731	385,3712	387,5528	394,0119	405,4664	422,0389	445,2733	401,8751	352,9006	318,2396	292,4072
35	Kivaldi2Kivaldi-006.jpg	Kivaldi	679,7923584	1157,549438	271187	263,339661	157,746674	256,708	241,0549	220,0586	201,6231	183,2375	168,412	152,5491	142,4251	128,9894	118,3056
36	Kivaldi2Kivaldi-007.jpg	Kivaldi	1023,654297	2219,151367	278497	293,970551	47,3710251	327,8468	329,6926	335,2039	344,818	359,2316	378,8474	399,9268	351,6967	316,3163	290,5282
37	Kivaldi3Kivaldi-001.jpg	Kivaldi	699,7525024	887,2798462	179940	239,400436	22,3218422	241,7486	248,19	251,3389	250,1286	251,6651	251,435	252,2513	249,558	247,4749	243,7532
38	Kivaldi3Kivaldi-002.jpg	Kivaldi	684,7023926	1186,392578	275416	295,39447	46,8366547	302,2976	300,4647	297,845	289,0385	282,785	271,8275	266,5254	260,1487	254,5235	249,5003
39	Kivaldi3Kivaldi-003.jpg	Kivaldi	1039,627686	2242,45166	199254	249,010315	37,5017242	255,8729	257,351	261,6222	269,1672	280,3426	295,8669	316,6559	316,8038	284,9669	261,7013
40	Kivaldi3Kivaldi-004.jpg	Kivaldi	1103,677002	2224,460205	236829	272,584229	31,1779766	278,8235	280,3834	285,1092	293,4651	305,3726	322,2381	345,2111	343,6686	309,0105	283,8691
41	Kivaldi3Kivaldi-005.jpg	Kivaldi	1054,563965	2211,972656	236202	271,220001	40,1705208	290,936	292,5858	297,4746	306,062	318,6705	335,9717	359,9991	361,7698	325,7268	299,3281

3 The results obtained and their discussion

Based on the data obtained in the application of 2.3.2.4-mode, a holistic and single typological scope was created with 60 and 10 descriptive types, in which the quantitative composition of gradations corresponds to the value of six hundred. With their help, the information was encoded, as a result of which a student's sample formed, having the form of the initial information of the tabular form [7-12].

To assess the level of reliability (verification procedure and synthesis) of three models of statistical order (matrix form of unconditional and conditional percentage redistributions, a correlation matrix) and seven models associated with cognitive-systems, a selection was used, which was compiled of 210 sheets with the systematization of images-images of leaves of ten graces of grace. The most significant value of reliability was demonstrated by the INF5 model. The corresponding conclusion was made when using Riesbergen V. F-criterion and developed by Lutsenko E.V. metrics L2 and L1 in 4.1.3.6-mode. At the same time, the averaged value of the reliability of the identification of the varietary-shaped is about 83% (with the 87-percent reliability of the correct relationship of the sheet to the varietal-shaped and 79 percent-the reliability of the correct non-assignment to it is not related to it as a sorceresses that is not related to it). Within the framework of the "Aidos" system complex, when using the 5.6-mode of the INF5, the model acted as the current one. Within its framework, using 4.1.2-mode, we carried out a packet type identification procedure.

Nevertheless, in the process of its implementation in a large number of situations, various kinds of errors appear that have a negative effect on the degree of reliability provided by the model. The main causal factor of their occurrence is due to the fact that in the composition of the educational purpose of the educational purpose on all class clusters there are "non-character" leaves for a particular variety, which are different in configuration with the majority (polymorphism).

In the context of this research work, it is advisable to note that within the framework of the "Aidos" system complex there is an extensive range of "tools" that allow you to make the relevant models better. In order to eliminate and identify in the sample of a student type of information about sheets that are non-characterized, 3.7.6-mode was used. This approach allowed to find and eliminate 99 such leaves from the sample.

The establishment of a model that provides the highest degree of reliability, followed by the endowment of its status "Model current" when using 4.1.3.6-mode immediately after the second iteration, made it possible to formulate a conclusion according to which a large number of models have a limit indicator of reliability in part L2-criteria. Nevertheless, the most optimal in terms of the indicator-criterion of the integral type of "amount of knowledge" (the total amount of knowledge contained in the system of factors of various nature, characterizing the management object, control factors and the environment, the transition of the object to future target or undesirable conditions) [10, 13) introduced herself an INF 4-model. Its degree of reliability, according to the developed Lutsenko E.V. metric, reached a value of 92% with 100 percent correct identification. Based on the data presented above, it is possible to state the inappropriateness of the implementation of subsequent iterations.

In the context of the presence of proper adequacy, the research work carried out in its regard can be perceived as an analysis of the direct object, the model of which is formed [7-8]. In particular, the level of class determinism seems the more significant than the average amount of information data on certain values/magnitudes of factors that relate to the transition of the simulated object to the state that lies with the state segment.

The study of the paret-croat-indicator of the level of class determination in 3.7.3-mode allows us to conclude that about 65% of the total significance within the framework of the INF4-model is provided by 50% of classes that are the most significant. As for the significance of gradations and gradations of scales from the category of "descriptive", then the corresponding pareto-fracture indicates 78% of their total significance, provided by 50% of the most significant gradations.

Using the INF4-model, tasks related to diagnosis, classification, identification and identification procedure are solved. Using the INF4-model of the 2-nd iteration, tasks associated with the diagnosis, classification, identification and identification procedure are solved (Fig. 3 - 5).

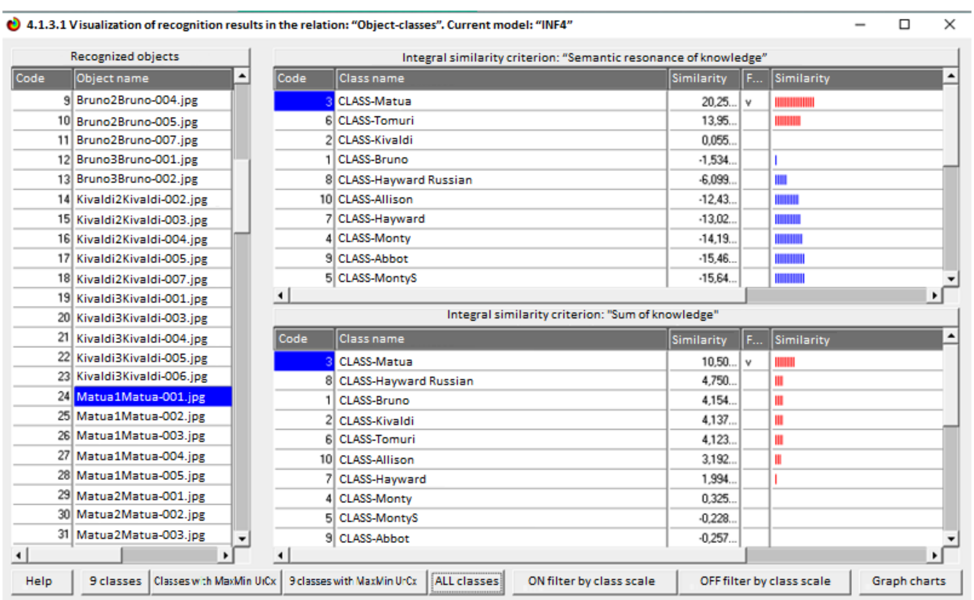

Fig. 3. Results of leaf identification with generalized images of the leaves of the *Actinidia deliciosa* (kiwi) varieties: object-class (sheet-sort). The symbol of "√" is worth the results of forecasting confirmed on the experience (corresponding to the fact).

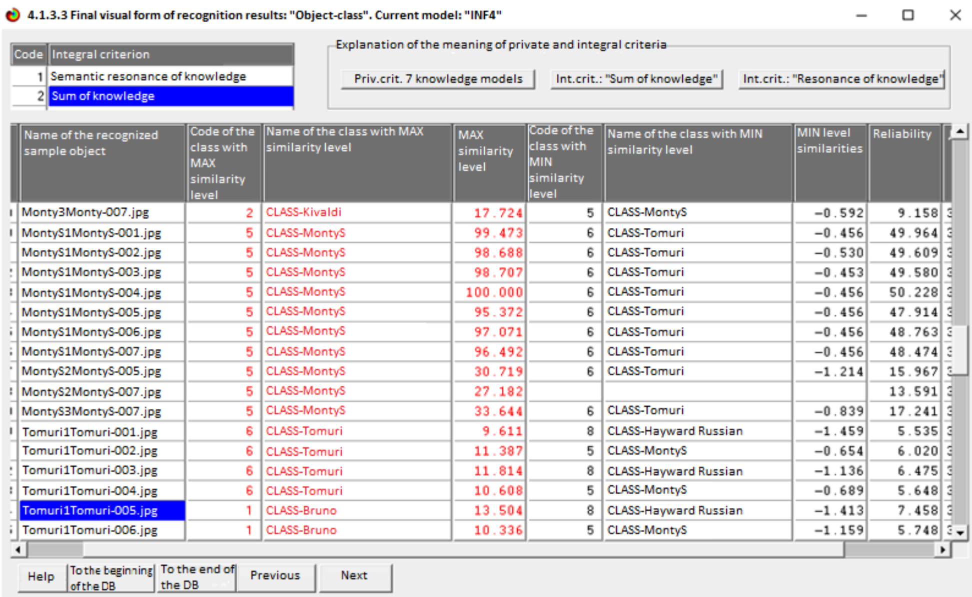

Fig. 4. The final visual form of recognition results: object-class (sheet-sort).

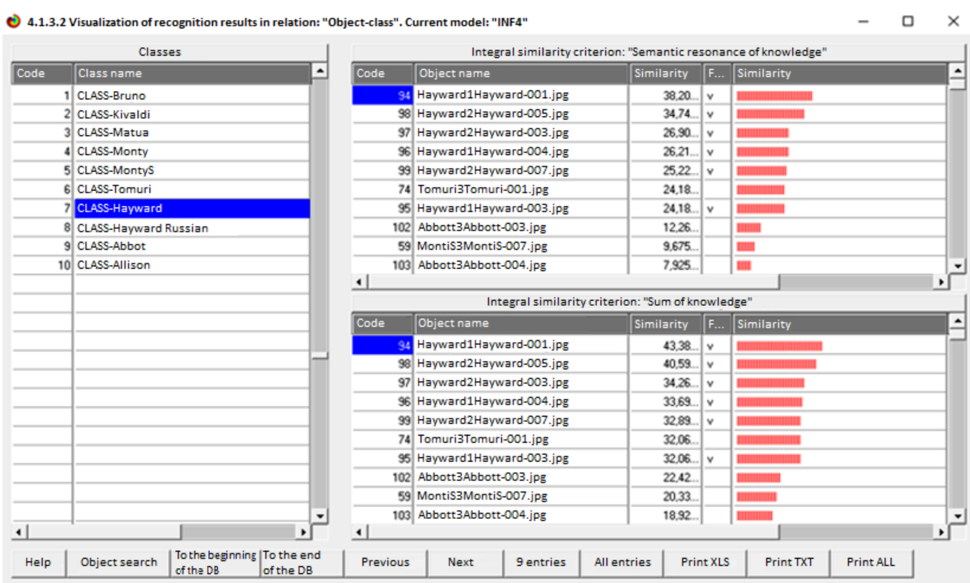

Fig. 5. Results of leaf identification with generalized images of the leaves of the *Actinidia deliciosa* (kiwi) varieties: class-object (variety list).

It is worthwhile to analyze in more detail the data obtained during the implementation of analytical work using a structural-cluster approach relative to the signs and cluster sectors (dendrograms and chart forms of cognitive type). If we proceed from 4.2.2.2-mode, then within its framework, class chart forms reveal the distinguishing and general features existing between classes.

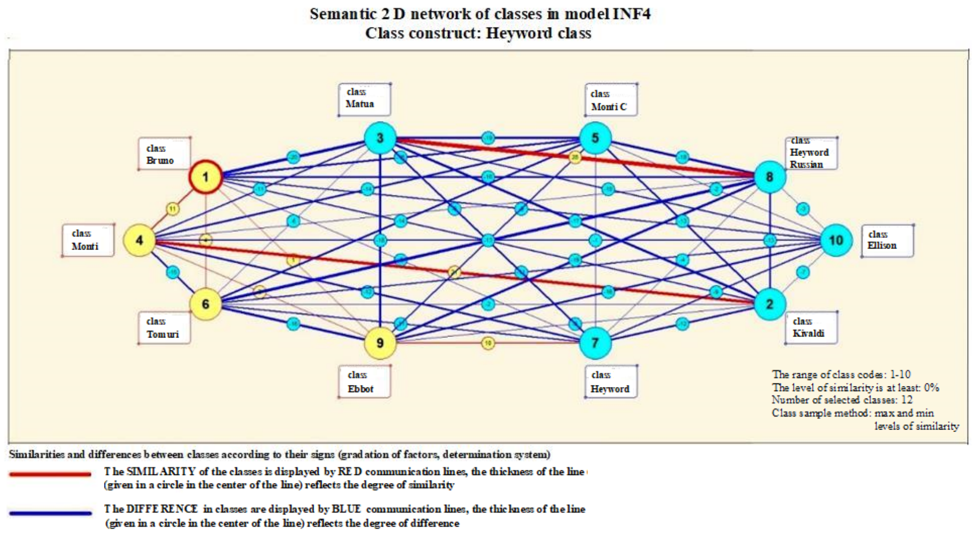

Fig. 6. The cognitive diagram reflecting the degree of similarity of generalized images of various classes (varieties) of kiwi according to the quantitative characteristics of the sheet contour using the design of the Heyword variety with generalized leaves of the leaves. The thickness of the line reflects the degree of similarity (red communication line) and the difference (blue communication line).

The content of figure 6 reveals the form of the output plan (one of them), in quantitatively, the limiting level of similarity of a certain variety -shaped with the subjects to systematize with images of different kiwi genotypes.

The Heyword - class construct includes all the tests studied and the levels of similarities and the differences between them are shown. So, the Heyword variety has 10% similarity with a generalized way of the Ebbot variety, and with male varieties of Matua and Tomuri similarity is 11-13%. Tomuri male variety is as different from all varieties, insignificant similarities (4%) with the female variety of Bruno, the matuity has 28% similarity with the female plant of the Heyword Russian plant Russian.

Information about the distinctive and general features of class clusters, reflected in the similarity of the matrix form, can be visualized not only in the form of cognitive diagrams, but also in the form of dendrograms of the agglomerative plan obtained in the process of clustering the cognitive order [13, 9, 7]. The relevant information is displayed in the content of figure 7.

Based on the formed dendrogram, which is classic, it is possible to state the following: the total set of signs of signs differentiate four separate clusters with concretized severity. The categorization of kiwi varieties according to the signs of determinants from the category “quantitative” inherent in sheet contours is clearly traced. The relevant information is given in the content of table 2. According to poles, the process of converting the modeled object in the conditions that properly meet the classes at the poles of the class construct is determined by the poles associated with the signs of the construct. The relevant data is disclosed in the content of figure 6.

Cluster №1 (indicated using green colors in figure 7) consists of a pair of varieties of female plants of kiwifruit culture (Ebbot and Heyword), the similarity of which is minimized.

The second, the most numerous, includes a subgroup with the varieties of Monti and Bruno with 11% similar parameters of the sheet of the sheet with a small area of the sheet, the subgroup of male varieties of the Matua and Tomuri, the dissimilarity of which with female varieties is 13%-17%.

The Matua has the largest variability of the area of the leaf surface, the similarity with Heyword Russian is 28%, Tomuri has much less. Kivaldi and Heyword, also included in this cluster, have a great variation of sheet parameters. Separately cost Monti C and Ellison. Thus, the data obtained confirm that the variability of the leaves of female plants is much lower than that of male.

Table 2. Class similarity matrix

	1-class Bruno	2-class Kivaldi	3-class Matua	4-class Monti	5-class Monti C	6-class Tomuri	7-class-Heyword	8-class Heyword Russian	9-class Ebbot	10-class Ellison
1-class Bruno	1	-0,08612	-0,201	0,109687	-0,15584	0,038025	-0,05324	-0,15553	0,005661	-0,09217
2-class Kivaldi	-0,08612	1	-0,16982	0,209568	-0,13085	-0,02477	-0,12075	-0,1294	-0,05147	-0,06952
3-class Matua	-0,201	-0,16982	1	-0,11406	-0,19228	-0,06453	-0,12515	0,276002	-0,18441	-0,10186
4-class Monti	0,109687	0,209568	-0,11406	1	-0,14159	-0,14845	-0,12131	-0,05894	0,019094	-0,11113
5-class Monti C	-0,15584	-0,13085	-0,19228	-0,14159	1	-0,1375	-0,00583	-0,17631	-0,10206	-0,01344
6-class Tomuri	0,038025	-0,02477	-0,06453	-0,14845	-0,1375	1	-0,11423	-0,2044	-0,15856	-0,11093
7-class-Heyword	-0,05324	-0,12075	-0,12515	-0,12131	-0,00583	-0,11423	1	-0,04304	0,096517	-0,08995
8-class Heyword Russian	-0,15553	-0,1294	0,276002	-0,05894	-0,17631	-0,2044	-0,04304	1	-0,18771	-0,0323
9-class Ebbot	0,005661	-0,05147	-0,18441	0,019094	-0,10206	-0,15856	0,096517	-0,18771	1	-0,1558
10-class Ellison	-0,09217	-0,06952	-0,10186	-0,11113	-0,01344	-0,11093	-0,08995	-0,0323	-0,1558	1

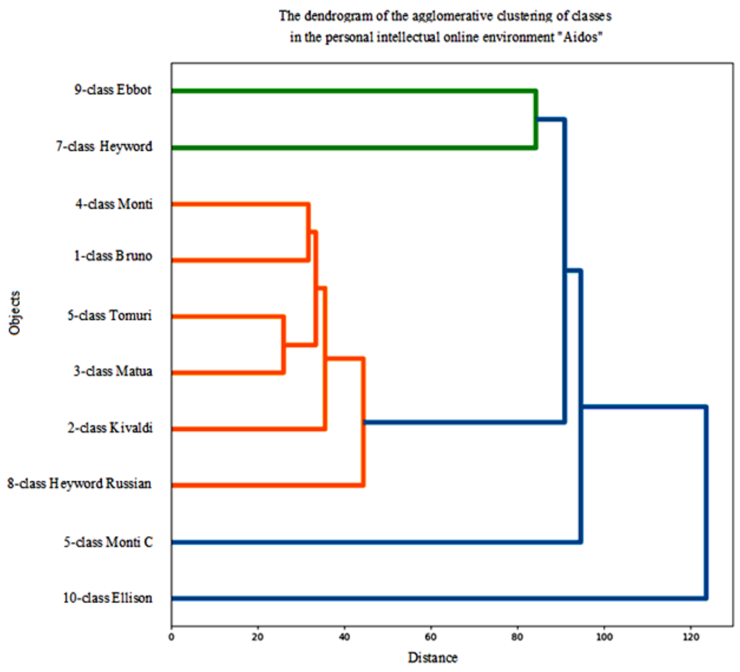

Fig. 7. The dendrogram of cognitive clusterization of the classic type, reflecting the degree of similarity and differences in classes (varieties of kiwi) according to the quantitative characteristics of the sheet contour.

4 Conclusions

From the above data, it follows that on the basis of leaf contour outlines and using the measurement technologies, ASA and the Aidos system complex, it is possible to organize and carry out the identification procedure relative to individual *Actinadia deliciosa* (kiwi). The use of an agglomerative-cognitive type clustering made it possible to differentiate the analyzed plant culture genotyles provided by the FRC SSC of the Russian Academy of Sciences, highlighting four key cluster structures consisting of individual substructures. The results of the research work indicate the presence of a polyploid structural device in kiwi. Such an analysis makes it possible to distinguish between individual genotypes an essential, pronounced polymorphism. Reflecting certain leaves of the model using the information theoretical concept provide data in the components of their contour outlines about the belonging of leaves to specific varieties.

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