ANALYSIS OF VEGETATIVE AND GENERATIVE CHARACTERS OF FRAGARIA VESCA L. (ROSACEAE) POPULATIONS

ABSTRACT

The rose family (Rosaceae) is one of the the richest with species and geographically most widespread plant families.This family includes herbaceous and woody species, shrubs and trees; the leaves are different, simple, or differently layered. The genus Fragaria (strawberry) includes perennial herbaceous plants.It is characteristic for this genus that the species reproduce intensively vegetatively with the help of above-ground stolons.Since the stolons at the nodes are rooted, that way they rise to new rosettes.The flowers have five-membered perianth with a developed outer calyx.The flower has a larger number of anthers and carpels.The aim of this research is to determine the forms and levels of individual, population and interpopulation variability of *Fragaria vesca* L. depending on the ecological factors under which they develop, to determine the most variable and consistent morphological characters that can serve in complete and critical taxonomic analysis and revision of this variable taxon. and related taxa from the Rosaceae family.A total of 150 specimens were sampled at the time of flowering for morphometric researches and 150 fruits at the time of fruiting. By conducted comparative morphological analyzes, it showed that the species *Fragaria vesca* L. shows a high degree of variability for all analyzed characters.

Keywords: Fragaria vesca, variability, taxa, characters

1. INTRODUCTION

The study of morphological characteristics of plants and the determination of the constancy of occurrence of a given character, in a large number of units, can present significant scientific data for the description of a certain species.Morphological traits are not always uniform. (Huseinovic et al., 2010, Huseinovic et al., 2012, Nikolic, 2013).If, during the ecological differentiation, there is a break in the genetic communication between the populations that inhabit different habitats, the basic conditions for the emergence of new taxa are acquired.Conclusions on the degree of similarity of individual taxa have some basis only if they take into account many characteristics: from macroscopic characteristics of the external habitus (eg age, branching, hairiness, leaf shape and size, structure and size of flowers, etc.) through physiological-ecological characteristics of life processes to the molecular range of chemical compounds (Ehrendorfer, 1997).

Research on the species *Fragaria vesca* L. has been carried out by a large number of scientists around the world. The most famous publications are: Adams, C. (Jamaican Flowering Plants, 1972); Clapham, A. R. et al. (Flora of the British Isles, 1962); F. Turk and Davis, P. H., ed. (Flora of Turkey and the Eastern Aegean Sea, 1965–1988); Duke, J. A. et al. (CRC Handbook of Medicinal Herbs, 2002); Zander and Encke, F. et al. (Handbook for Plant Determination, 1993); Glea Cron and Gleason, H. A. & A. Cronquist. (Manual for the Determination of Vascular Plants of the Northeastern United States Bordering Canada, 1963); Hitchcock, C. L. et al. (Vascular Plants of the Northwest Pacific, 1955–1969); Iwatsuki, K. et al. (Flora of Japan, 1993)

The nomenclature of the species given in the record review is in a project of typified Line plant names housed in the Museum of Natural History in London. 09/03/1999 is a verified species name by ARS Systematic Botanists.The last change in the nomenclature of the species was made on January 14, 2006. The germplasm of the species *Fragaria vesca* L. is stored in the National Germplasma repository for cloning in Corvallis.
According to the degree of biodiversity determined to date, the family Rosaceae is one of the most systematically complex taxa.The family includes 115 genera and over 3000 species. Today's taxonomy most often uses the division of the Rosaceae L family to 4 subfamilies: Spiraeoideae, Rosoideae, Maloideae (Pomoideae) and Prunoideae.
The systematic position of the genus *Fragaria* L. within the family Rosaceae L. is as follows:
Family: Rosaceae
Juss., Gen. 334 (1789): Benth. Hook., Gen., I, 600; Baill., Hist pl., I, 346; Focke in Nat. Pflanzenf., III, 3, I; Asch. Gr. Son. Mitt. Fl, VI 1, 5; Beck in Reich., Ic. Fl. Germ., XXV 1, 2.

Tribus 1: Dryadeae

Vent., Tabl., III, 346 (1799); DC, Prodr., II, 549; Beck, Fl. Nied. - Öst., 718 et in Reich., Ic. Fl. Germ., XXV 1, 2. - Potentilleae Juss., Gen., 337 (1789); div. Potentillea Spreng, Anl, II 2. 863 (1818); trib, aput Benth.Hook., Gen, I, 603; Focke in Nat. Pflazenf., III 3, 28; Asch. Gr. Syn.mitt. Fl., VI, 440.

Subtribus: Potentilleae
Beck in Reich., Ie. Fl. Germ., XXV 1, 70.

Genus: Fragaria
L., Spec. pl., 494 (1753) et Gen, ed V, 518 no. 58; Benth. Hook., Gen., I, 620; Focke in Engl.
Prantl, Nat. Pflanzenf, III 3, 33; Asch. Gr., Syn. Mitt. Fl., VI, 649; Beck in Reich., Ic. Fl. Germ, XXV 1, 2. - Confer: Solms-Laubach, unber unsere Erbeeren und ihre Geschlichte in Bot. Time. (1907) Heft III - IV.
Table 1 shows the current status of individual species of the genus (Tutinetal. (Ed), 1964-1993, Flora Europaea).

2. MATERIAL AND METHODS OF WORK

Live material of *Fragaria vesca* L species was collected at selected ecologically different habitats. At each locality a sample of at least 30 individuals from the population in the flowering and fruiting phenophase was taken. Morphological variability was perceived based on 5 populations and 150 individuals. During the collection of plants in the field, the keys for the determination of plant species were used (Domac, 1997), (Aichele, 2004).All specimens are neatly stored in the herbarium.

As the collection of plant material was done at the time of flowering and at the time of fruiting, the material collected at the time of flowering (late May and early June) was neatly herbariumed.Each population and its individual are marked with special numbers.

In addition to morphometric and statistical processing of materials and data, the laboratory part of the research included numerous activities: consulting the relevant literature, collecting and processing ecoclimatic data, making original illustrations, etc.
Morphological - anatomical researches of the species *Fragaria vesca* L. from the localities Vučkovci, Rajska, Zelina Srednja, Svirac and Krečane were realized in the laboratories of the Faculty of Natural Sciences and Mathematics in Tuzla.

3. RESULTS AND DISCUSSION

The taxon *Fragaria vesca* L. has expressed ecological valence in relation to the complex of ecological factors. Its populations develop very well on the bare parent substrate, on shrubs, fires, and on developed soils of hornbeam, beech, oak, ie. by mixed forest type of forest.

3.1. VARIABILITY OF MORPHOMETRIC CHARACTERS

Comparative-morphological analysis of the collected floristic material from different habitats showed a significant degree of variability of the character set in the taxon *Fragaria vesca* L.

Table1. Comparative presentation of statistical data for the studied characters of the genus *Fragaria vesca* L. in the observed populations

All	Valid N	Mean	Median	Variance	Std.Dev.	Coef.Var.	Stand. Error	Skewness	Curtosis
Plant height with flowers	150	20.571	18.7	38.275	6.187	30.074	0.505	0.851	0.378
Total Leaf Length With Leaf Handle	150	15.825	15.0	25.191	5.019	31.715	0.410	0.770	0.249
The length of the leaf stalk of the rosette leaf	150	11.440	10.8	18.860	4.343	37.961	0.355	0.831	0.613
Length of Middle Lobe Rosette Leaf	150	4.220	4.1	1.588	1.260	29.858	0.103	0.605	0.337
Maximum width of the middle lobe of the leaf	150	2.726	2.6	0.403	0.635	23.292	0.052	0.366	0.165
Length of First Lobe rosette leaf	150	3.390	3.3	0.845	0.919	27.119	0.075	0.512	1.067
Maximum width of the first lobe of the rosette	150	2.259	2.2	0.345	0.587	26.005	0.048	0.716	0.776
Flower Stalk Length	150	3.037	2.8	1.610	1.269	41.774	0.104	1.298	2.935
The length of the inner calyx leaf	150	0.549	0.5	0.030	0.173	31.406	0.014	2.519	17.775
Maximum width of the inner calyx leaflet	150	0.242	0.2	0.006	0.077	31.944	0.006	2.469	17.101
Petal length	150	0.701	0.7	0.051	0.226	32.297	0.018	0.298	0.767
Maximum Drawer Width	150	0.658	0.6	0.049	0.221	33.651	0.018	0.255	-1.156
Number of teeth on the middle lobe of the rosette leaf on one side	150	8.153	8.0	1.889	1.374	16.857	0.112	-0.328	5.769
Width of Outer Calyx Leaf	150	0.298	0.3	0.022	0.149	50.011	0.012	0.052	-1.270
Length of Outer Calyx Leaf	150	0.126	0.1	0.003	0.058	46.197	0.005	2.942	11.851
Fruit length	150	9.522	9.4	3.516	1.875	19.691	0.153	1.073	4.050
Fruit width	150	9.808	9.7	3.202	1.789	18.243	0.146	1.758	7.285

Table 1 shows significant variations of all observed characters. Following the coefficient of variability, it is noticeable that the characteristics of the width of the outer calyx (50.011%), the length of the flower stalk (41.774%) vary far more than the character of the number of inserts on the middle retinal leaf least variable character.

3.1.1. Results of variational-statistical analysis

3.1.2. T-test results in a comparison of morphometric characters

Locality 1: Locality 2, 3, 4, 5 Statistically significant differences were found in the comparisons of the following characters (Table 2):

Table 2: Characters for which statistically significant differences were found at locations 2,3,4,5

Locations	Location 1	Lokation 2		Lokation3		Lokation 4		Lokation 5	
Variable	t-value	t-value	p-value	t-value	p	t-value	p	t-value	p
Plant Height With Flowers		0.70	0.488	1.66	0.102	-0.27	0.785	-5.83	0.000
Total Leaf Length With Leaf Handle		0.46	0.650	-0.01	0.994	2.31	0.025	-7.23	0.000
The length of the leaf stalk of the rosette leaf		0.22	0.825	-0.54	0.593	1.65	0.103	-6.27	0.000
Length of Middle Lobe Rosette Leaf		1.13	0.264	1.52	0.134	3.65	0.001	-1.32	0.193
Maximum width of the middle lobe of the leaf		0.84	0.403	1.45	0.151	2.66	0.010	-1.44	0.156
Length of First Lobe rosette leaf		2.12	0.038	-0.54	0.593	-0.14	0.890	-1.47	0.146
Maximum width of the first lobe of the rosette leaf		0.43	0.667	-1.10	0.276	-1.26	0.211	-1.12	0.269
Flower Stalk Length		4.10	0.000	3.19	0.002	3.44	0.001	-1.11	0.270
The length of the inner calyx leaf		2.29	0.026	2.57	0.013	1.11	0.271	2.09	0.041
Maximum width of the inner calyx leaflet		1.91	0.061	2.70	0.009	0.65	0.518	0.94	0.352
Petal length		-0.91	0.366	1.26	0.213	-8.02	0.000	-1.95	0.056
Maximum Drawer Width		-0.49	0.627	1.31	0.197	-7.90	0.000	-1.08	0.285
The number of teeth on the middle lobe of the rosette leaf on one side		0.56	0.576	-0.98	0.333	-1.71	0.092	-1.02	0.311
Width of Outer Calyx Leaf		-0.22	0.829	-1.18	0.241	-1.90	0.063	-1.68	0.099
Length of Outer Calyx Leaf		-0.45	0.653	0.68	0.497	-1.75	0.086	-0.41	0.681
Fruit length		-0.12	0.908	0.37	0.713	0.78	0.440	1.08	0.284
Fruit width		-0.48	0.634	-1.21	0.231	-2.80	0.007	0.35	0.725

In the comparison of the characters: Total leaf length with the petiole, length of the first lobe of the rosette leaf, length of the flower stalk, length of the inner calyx, maximum width of the inner calyx, fruit width, less statistical significance was found.

Table 3. Characteristics for which statistically significant differences were found at locations 1,3,4 and 5

Locations	Location 1	Location 2	Location 3	Location 4	Location 5

Variable	t-value	p	tt-value		t-value	p	t-value	p	t-value	p
Plant Height With Flowers	0.70	0.488			0.80	0.429	-1.11	0.272	-6.62	0.000
Total Leaf Length With Leaf Handle	0.46	0.650			-0.53	0.598	1.69	0.097	-7.33	0.000
The length of the leaf stalk of the rosette leaf	0.22	0.825			-0.73	0.468	1.30	0.200	-6.19	0.000
Length of Middle Lobe Rosette Leaf	1.13	0.264			-0.04	0.965	1.93	0.058	-2.22	0.030
Maximum width of the first lobe of the rosette leaf	0.84	0.403			0.51	0.615	1.75	0.085	-2.19	0.032
length of first lobe rosette leaf	2.12	0.038			-2.56	0.013	-2.00	0.050	-3.06	0.003
Maximum width of the first lobe of the rosette leaf	0.43	0.667			-1.57	0.121	-1.63	0.109	-1.48	0.143
Flower Stalk Length	4.10	0.000			-1.49	0.141	-1.50	0.140	-4.26	0.000
The length of the inner calyx leaf	2.29	0.026			-0.08	0.934	-2.06	0.044	-0.65	0.517
Maximum width of the inner calyx leaflet	1.91	0.061			0.66	0.515	-1.94	0.057	-1.57	0.122
Petal length	-0.91	0.366			2.34	0.023	-6.83	0.000	-0.93	0.356
Maximum Drawer Width	-0.49	0.627			1.89	0.063	-7.46	0.000	-0.55	0.585
The number of teeth on the middle lobe of the rosette leaf on one side	0.56	0.576			-1.90	0.063	-3.22	0.002	-2.25	0.028
Width of Outer Calyx Leaf	-0.22	0.829			-1.06	0.293	-1.84	0.071	-1.60	0.114
Length of Outer Calyx Leaf	-0.45	0.653			1.08	0.286	-1.32	0.193	-0.08	0.938
Fruit length	-0.12	0.908			0.45	0.656	0.89	0.377	1.22	0.227
Fruit width	-0.48	0.634			-0.91	0.000	-2.26	0.028	0.77	0.444

Minor statistically significant differences were observed for: the length of the first lobe of the rosette leaf, the length of the inner calyx, the length of the petal, the number of teeth on the middle lobe of the rosette leaf on one side, the fruit expands.

Table 4. Characters for which statically significant differences were found at locations 1,2,4 and 5

Locations	Location 1		Location 2		Location 3		Location 4		Location 5	
Variable	t-value	p	t-value	p	t-value	p	t-value	p	t-value	p
Plant Height With Flowers	1.66	0.102	0.80	0.429			-2.68	0.009	-9.36	0.000
Total Leaf Length With Leaf Handle	-0.01	0.994	-0.53	0.598			2.77	0.007	-8.16	0.000
The length of the leaf stalk of the rosette	-0.54	0.593	-0.73	0.468			2.39	0.020	-6.22	0.000

leaf										
Length of Middle Lobe Rosette Leaf	1.52	0.134	-0.04	0.965			2.94	0.005	-2.88	0.006
Maximum width of the middle lobe of the leaf	1.45	0.151	0.51	0.615			1.44	0.156	-2.87	0.006
Length of First Lobe rosette leaf	-0.54	0.593	-2.56	0.013			0.34	0.734	-1.03	0.309
Maximum width of the first lobe of the rosette leaf	-1.10	0.276	-1.57	0.121			-0.43	0.667	-0.26	0.793
Flower Stalk Length	3.19	0.002	-1.49	0.141			0.08	0.936	-3.48	0.001
The length of the inner calyx leaf	2.57	0.013	-0.08	0.934			-3.08	0.003	-0.83	0.410
Maximum width of the inner calyx leaflet	2.70	0.009	0.66	0.515			-3.67	0.001	-3.13	0.003
Petal length	1.26	0.213	2.34	0.023			-12.56	0.000	-3.92	0.000
Maximum Drawer Width	1.31	0.197	1.89	0.063			-11.94	0.000	-2.80	0.007
The number of teeth on the middle lobe of the rosette leaf on one side	-0.98	0.333	-1.90	0.063			-0.73	0.471	0.10	0.918
Width of Outer Calyx Leaf	-1.18	0.241	-1.06	0.293			-0.81	0.422	-0.50	0.617
Length of Outer Calyx Leaf	0.68	0.497	1.08	0.286			-2.26	0.028	-0.85	0.398
Fruit length	0.37	0.713	0.45	0.656			0.22	0.827	0.37	0.716
Fruit width	-1.21	0.231	-0.91	0.000			-0.41	0.681	1.38	0.173

Minor differences were found for: height of plant with flowers, total length of leaf with petiole, length of leaf stalk of rosette leaf, length of middle lobe of rosette leaf, length of first lobe of rosette leaf, length of flower stalk, length of inner calyx, maximum width of inner calyx , petal length, length of outer calyx.

Table 5. Characters for which statistically significant differences were found at sites 1,2,3 and 5

Locations	**Location 1**		**Location 2**		**Location 3**		**Location 4**		**Location 5**	
Variable	t-value	p	t-value	p	t-value	p	t-value	p	t-value	p
Plant Height With Flowers	-0.27	0.785	-1.11	0.272	-2.68	0.009			-6.72	0.000
Total Leaf Length With Leaf Petiole	2.31	0.025	1.69	0.097	2.77	0.007			-9.67	0.000
The length of the leaf stalk of the rosette leaf	1.65	0.103	1.30	0.200	2.39	0.020			-7.47	0.000
Length of Middle Lobe Rosette Leaf	3.65	0.001	1.93	0.058	2.94	0.005			-4.68	0.000
Maximum width of the middle lobe of the leaf	2.66	0.010	1.75	0.085	1.44	0.156			-3.90	0.000
Length of First Lobe rosette leaf	-0.14	0.890	-2.00	0.050	0.34	0.734			-1.25	0.215
Maximum width of the	-1.26	0.211	-1.63	0.109	-0.43	0.667			0.15	0.885

first lobe of the rosette leaf										
Flower Stalk Length	3.44	0.001	-1.50	0.140	0.08	0.936			-3.63	0.001
The length of the inner calyx leaf	1.11	0.271	-2.06	0.044	-3.08	0.003			2.02	0.048
Maximum width of the inner calyx leaflets	0.65	0.518	-1.94	0.057	-3.67	0.001			0.51	0.612
Petal length	-8.02	0.000	-6.83	0.000	-12.56	0.000			6.75	0.000
Maximum Drawer Width	-7.90	0.000	-7.46	0.000	-11.94	0.000			8.17	0.000
The number of teeth on the middle lobe of the rosette leaf on one side	-1.71	0.092	-3.22	0.002	-0.73	0.471			1.09	0.278
Width of Outer Calyx Leaf	-1.90	0.063	-1.84	0.071	-0.81	0.422			0.35	0.730
Length of Outer Calyx Leaf	-1.75	0.086	-1.32	0.193	-2.26	0.028			1.02	0.311
Fruit length	0.78	0.440	0.89	0.377	0.22	0.827			0.17	0.868
Fruit width	-2.80	0.007	-2.26	0.028	-0.41	0.681			2.79	0.007

The following statistical significance was determined for these localities for: height of the plant with flowers, total height of the leaf with the petiole, length of the petiole of the rosette leaf, length of the middle lobe of the rosette leaf, length of the inner calyx, maximum width of the inner calyx, number of teeth on the middle lobe rosette leaf on one side, length of outer calyx leaf, fruit width.

Table 6. Characters for which statistically significant differences were found at locations 1,2,3 and 4

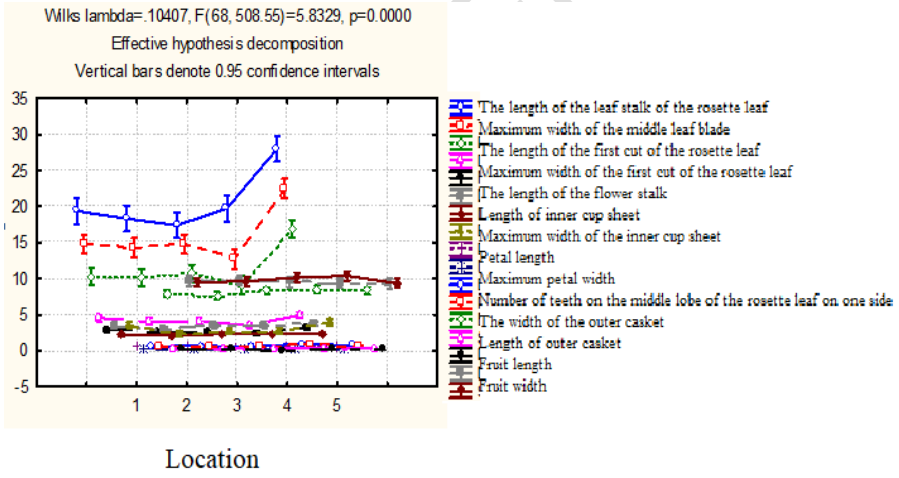
Locations	**Location 1**		**Location 2**		**Location 3**		**Location 4**		**Location 5**	
Variable	t-value	p-value	t-value	p	t-value	p	t-value	p	t-value	
Plant Height With Flowers	-5.83	0.000	-6.62	0.000	-9.36	0.000	-6.72	0.000		
Total Leaf Length With Leaf Handle	-7.23	0.000	-7.33	0.000	-8.16	0.000	-9.67	0.000		
The length of the leaf stalk of the rosette leaf	-6.27	0.000	-6.19	0.000	-6.22	0.000	-7.47	0.000		
Length of Middle Lobe Rosette Leaf	-1.32	0.193	-2.22	0.030	-2.88	0.006	-4.68	0.000		
Maximum width of the middle lobe of the leaf	-1.44	0.156	-2.19	0.032	-2.87	0.006	-3.90	0.000		
Length of First Lobe rosette leaf	-1.47	0.146	-3.06	0.003	-1.03	0.309	-1.25	0.215		
Maximum width of the first lobe of the rosette leaf	-1.12	0.269	-1.48	0.143	-0.26	0.793	0.15	0.885		
Flower Stalk Length	-1.11	0.270	-4.26	0.000	-3.48	0.001	-3.63	0.001		

The length of the inner calyx leaf	2.09	0.041	-0.65	0.517	-0.83	0.410	2.02	0.048		
Maximum width of the inner calyx leaflet	0.94	0.352	-1.57	0.122	-3.13	0.003	0.51	0.612		
Petal length	-1.95	0.056	-0.93	0.356	-3.92	0.000	6.75	0.000		
Maximum Drawer Width	-1.08	0.285	-0.55	0.585	-2.80	0.007	8.17	0.000		
The number of teeth on the middle lobe of the rosette leaf on one side	-1.02	0.311	-2.25	0.028	0.10	0.918	1.09	0.278		
Width of Outer Calyx Leaf	-1.68	0.099	-1.60	0.114	-0.50	0.617	0.35	0.730		
Length of Outer Calyx Leaf	-0.41	0.681	-0.08	0.938	-0.85	0.398	1.02	0.311		
Fruit length	1.08	0.284	1.22	0.227	0.37	0.716	0.17	0.868		
Fruit width	0.35	0.725	0.77	0.444	1.38	0.173	2.79	0.007		

Statistically less significant differences were found for: length of middle lobe of rosette leaf, length of first lobe of rosette leaf, length of inner calyx, maximum width of petals, number of teeth on middle lobe of rosette leaf on one side, fruit width.

3.1.3.An's analysis

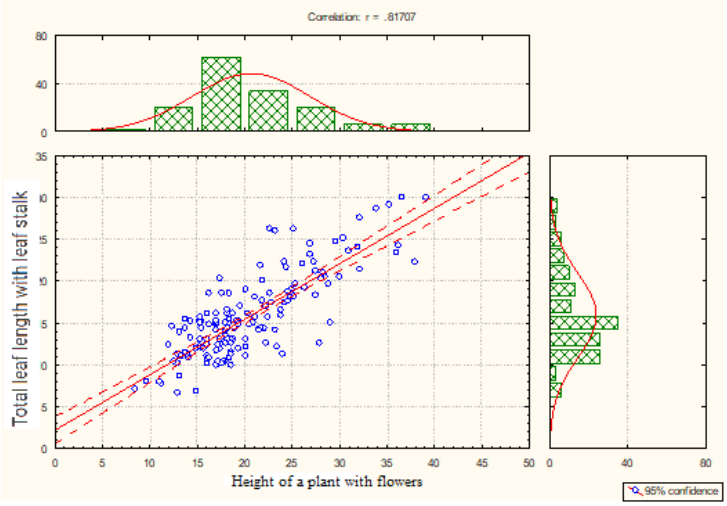
The difference between all locations for all variables together is tested. Testing is performed by Wilks-lambda test and it is shown that there is a significant difference between variables by location ($p < 0.01$).



Graph 1: An's analysis

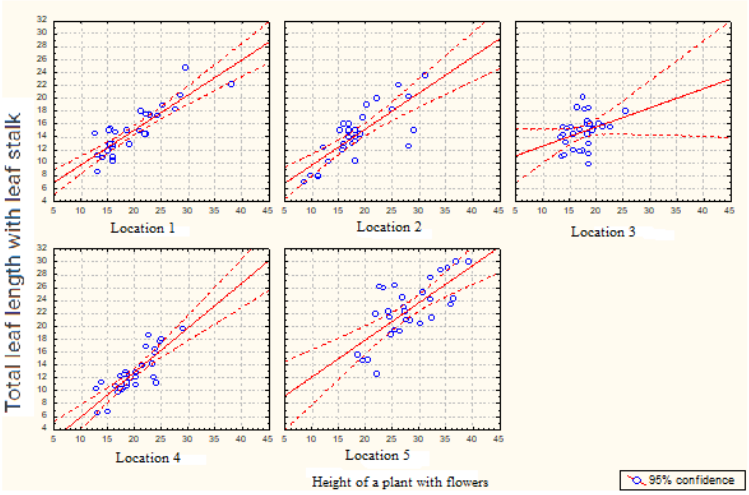
Minor statistically significant differences of An's analysis were found when comparing the variables: length of middle lobe of rosette leaf, maximum width of middle lobe of rosette, length of first lobe of rosette leaf, length of flower stalk, length of inner calyx, maximum width of inner calyx.

3.1.4. Correlations



Graph 2. Significant correlations for the characters total leaf length with leaf stalk and plant height with

A statistically significant correlation was found between the height of the plant with flowers and the total length of the leaf with the leaf stalk. This correlation is greater than 0.80.



Graph 3: Significant correlations for the characters total leaf length with leaf stalk and plant height with flower

The expressed ability to vary the observed morphometric and meristic characters is the basis of the occurrence of the species *Fragaria vesca* L. in different types of ecosystems. Within the range of variation, trends of character changes in individual populations were monitored.

3.2. MORPHOLOGICAL-ECOLOGICAL DIFFERENTIATION OF POPULATIONS

The least variable character is the number of teeth on the middle lobe of the rosette leaf on one side which together with the maximum width of the middle lobe of the rosette and the maximum width of the first lobe of the rosette leaf.Observing the values of individual characters by localities, certain legitimaties can be established. The height of individuals is highest in populations at locality 5 (Krečane) and locality 4 (Svirac).

Strawberry fruits have high resource values and antioxidant potential.It should be emphasized that the size of the fruit follows the overall size of the individual. Fruit height is highest in populations from the Rajska locality (2). In the given locations, in forest conditions, the light was limited. Minor fruit variations are present in other localities.

Fruit width is greatest in populations from Svirac (4) and Krečane (5). These localities represent communities of open habitats and forest edges, which leads to the conclusion that these are communities that provide optimal conditions for strawberry growth with their ecological characters.
Differences among the morphological characteristics of populations stem from differences in the ecological factors prevailing in their habitats.

The determined high degree of variability of the analyzed characters indicates also high interpopulation variability, which further indicates the possible influence of many environmental factors. (Huseinović et al. 2010).Basis of high degree of variability of genetic determination of *Fragaria vesca* L. A wide ecological valence in relation to the complex of ecological factors, the species acquired by spreading to ecologically very dynamic habitats, most often ecotones, where ecological factors collide two different habitats (eg forests and meadows). (Huseinović et al. 2015)As a specific response of this species to the dynamic (variable) values of ecological factors, the variability of morphological and meristic characters is expressed, which has the function of adapting populations to present ecological factors, ie the function of best utilization of habitat capacity and potential. (Huseinović et al. 2012).

The highest value of the length of the flower stalk was observed in individuals from the population from locality 3 (Islamovac), while the lowest values were recorded at the localities Palanka (locality 4) and Brezovo Polje (locality 1). According to (Huseinović, 2008; Huseinović et al., 2010; Huseinović et al., 2014), the length of the flower stalk is of great importance in adapting the population to the existing habitat conditions. Individuals from locality 2 (Brčko) have the highest value for leaf width, while individuals from locality 1 (Brezovo Polje) have the lowest value of leaf width.
The medium value of the length of the flower stalk varies from 2.327 cm at the locality Rajska (2), to 3.910 cm at the locality Krečane (5). The coefficient of variability of this character ranges from 27.243% at the locality Svirac (4), to 51.265% at locality Rajska (2).

4. CONCLUSION

The study of populations of *Fragaria vesca* L. (*Rosaceae*) covered a total of 5 localities in the municipality of Gradačac, which were different in their ecological characteristics, such as altitude (from 145 to 346), geological background, soil type, etc. Samples were collected in April 2017. in the phenophase of flowering and fruiting. A total of 150 specimens were sampled at the time of flowering for morphometric surveys (external morphology), and 150 specimens in the fruiting phase.
Conducted comparative morphological analyzes showed that the species *Fragaria vesca* L. shows a high degree of variability for all analyzed characters.

4.1. VARIABILITIES MORPHOMETRIC CHARACTERS

4.1.1 Participation of individual characters in total variability

- A comparative analysis of data on the variation of individual characters clearly shows that the width of the outer calyx is one of the most variable characters (KV = 50.011). The next character is the length of the outer (KV = 46.197%), and the next length of the flower stalk (KV = 41.774%), the length of the leaf stalk of the rosette leaf (KV = 37.961%), the maximum width of the petal (KV = 33.651%), the length of the petal = 32.297%), maximum width of the inner calyx (KV = 31.944%), total leaf length with leaf stalk (KV = 31.715%), length of the inner calyx (KV = 31.406%), height of the plant with flowers (KV = 30.074%)).
- Characteristics with the lowest coefficient of variability: length of middle lobe of rosette leaf (KV = 29.858%), length of first lobe of rosette leaf (KV = 27.119%), maximum width of first lobe of rosette leaf (KV = 26.005%), maximum width of middle leaf lobe (KV = 23.292%),
- Based on the research it is possible to conclude that vegetative characters plants have a far larger share of the total variability of the generative character

4.1.2 Intrapopulation variability

- The highest coefficient of variability at the locality (1) was recorded for the variable width of the outer calyx (62.269%), and the lowest for the character is the maximum width of the middle lobe of the leaf (21.321%).
- At locality (2), the highest coefficient of variability was recorded for the width of the outer calyx leaflet (50.775%), and the lowest (15.821%) for the number of teeth on the middle lobe of the rosette leaf on one side.
- At locality (3) a high coefficient of variability was recorded for the width of the outer calyx (47.229%), and the lowest for the character of the height of the plant with flowers (16.269%)
- At locality (4), the length of the outer calyx varies the most (49.793%), and for the maximum width of the petals KV is 10.578%.
- The highest coefficient of variability at locality (5) was recorded for the length of the outer calyx leaflet (61.967%), and the lowest for the number of teeth on the middle lobe of the rosette leaf on one side (11.474%).
- Based on the above, it can be concluded that the width of the outer calyx and the length of the outer calyx are of great importance in adapting the population to the existing habitat conditions.

4.2. VARIABILITY CHARACTER OF FRUIT

- The highest coefficient of variability for fruit height was recorded at locality (3) 29.081%, and the lowest at locality (2) 13.745%.
- In the variation of fruit width, the highest coefficient of variability was recorded at locality (3) 27,300%, and the lowest is 11,161% and was recorded at locality (4).
- The coefficient of variability for fruit height is 19.691%, and for fruit width 18.243%.
- Thus, fruit does not belong to the group of those plant parts that vary the most. However, given the high value of strawberry value, it is necessary to emphasize that the size of the fruit follows the overall size of the individual. Which indicates that strawberry, in our conditions, thrives optimally in well-lit to somewhat shaded relatively warm habitats of the mountain belt.

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