

RESEARCH ARTICLE

(Open Access)**The variation of morphological indicators of Uva Ursi (*Arctostaphylos uva-ursi* L.) in Korabi Mountain - Albania**ZYBER GJONI¹, FOTO KASHTA², NIKOLLAQ BARDHI²,¹University of Durrës, Albania²Agricultural University of Tirana

*Corresponding author e-mail: zybergjoni@yahoo.com

Abstract

Uva Ursi is widespread in Mount Korab, mainly in soils with high content of gypsum. From the appearance and morphologic construction, the plants represent changes of plant organs in the number and size. This was the reason that the study was undertaken to determine the morphological variation [3, 4, 10] for some indicators, such as the length and number of branches and internodes length, the number of leaves, the length of leaves, the width of leaves and length of the leaf tail. Besides morphological indicators, the weights are made for: the quantity of leaves per plant, the weight of the wet and dry mass and their ratio, the weight of 100 dried and fresh leaves. These indicators are measured and weighed for seven geographic points where the spread and development of plants is very good. In conclusion it was made the data processing and calculation of the correlation coefficients [8, 9] between the measured indicators. By processing and analysis of morphological indicators it is concluded that the plants represent statistically validated changes in the indicators measured for seven points, where the samples are taken. Among the indicators it has strong links, and specifically between the length of the leaf with the leaf width, as well as for plant production

Key words: Uva ursi, indicators, morphological, correlation and sample.

Introduction

Uva ursi is not a well-known plant, a shrubs-plant of the subalpine regions, meadows, forests and mountains up to a height of about 2000-2500 m. It is almost a trailing plant with a height about 30 cm, with evergreen leaves, which change every three years. The leaves are oval in scapular shape, alternating on the stalk. The flowers are white on lighter pink, bell-shaped. The grains are spherical, red color and not pleasant smell. Uva ursi contains glucosid hydrochynonic (arbutosid or arbutine, metil-arbutine) hydrolyzed tannin, glikozide iridoid (mono-tropeine), flavonoids (miricetine) and terpenoides (alpha- and beta-amirina, uveol, ursolic acid). Due to its ingredients, uva ursi has therapeutic properties and is used as a diuretic, urinary disinfectant and as a astringent. Its antibacterial effect is due to arbutine. Due to arbutin, the hidrokinone release the urinary metabolites that are active antibacterial. Are these precious properties of this plant that make it necessary

to study. We have focused the study interest on two directions:

First, to her spread, it's because this plant is not encountered anywhere, but in certain ecological environments.

Second, in its study of genetic and biological variation, in order to emerge values of populations which are in our territory. According to [1] there is the possibility of genetic improvement of medicinal plants. Genetic variation is one of the basic indicators of the vegetation. The study of genetic variation in each species has a special importance, because thus, we can identify not only the forms that provide large amounts of production (in the case of uva ursi the parts usable are mainly leaves), but also those that have content high chemical substances, as well as the separate factions that represent special interest in traditional folk medicine. According [6, 7], uva ursi populations represent a variation in the content of the active substances of arbutine. Based on genetic criteria, the variation can be studied at several levels,

morphological, chromosomal, chemical level of protein and DNA sequences [1, 2, 5]. In this study we are focused on the variation of populations of Korab mountain, based on morphological indicators to know their values.

The scope and methods of the study

The object of study was to identify the variation in uva ursi based on some quantitative features. First, they are determined the places where samples were taken for measurement and evaluation. Previously, it became a preparatory work by collecting data on the characteristic places where are been found the sources of uva ursi. The sites where were received the samples were:

Table 1 The sites where samples were taken on which was conducted the morphological study of uva ursi populations, Korab 2015

<i>Denomination of the place</i>	<i>The height above sea level</i>
Borovajk i Begjunecit	1377
Gropat e Staneve	1475
Mali i Vrenjtit	1526
Llofkat e Sllatinës	1615
Livadhi i Gjatë	1655
Kodrat e Bregut	1690
Përroi i Pasqyrës	1868

As shown, uva ursi populations have the names of the places where these populations are widespread and they have each special feature, like height, exposition, soil composition, plant associations, etc.

During the sampling, it was targeted as much as possible to be caught variation of uva ursi in Korab Mountain, where from our explorations results that here are the most common sites of uva ursi in Albania.

In each sites, they were taken 50 plants, in three points where habitation is the most complete and it was analyzed an average sample of 50 plants, on which the measurements were made.

The identification of variation was made at the level of some morphological indicators, according

to the places where they were taken the samples. This was based on biometric data surveyed in the plant field of uva ursi populations. The data obtained from the samples were divided into two groups according to their nature.

The first group of data

- The length of sprig, (cm)
- The number of sprig/plant
- The length of internodes, (cm)
- The length of leaf, (cm)
- The width of leaf, (cm)
- The number of leaves/sprig

The second group of data

- The weight of leaves/plant (fresh, g)
- The weight of leaves/plant (dry, g)
- The weight of 100 leaves (fresh, g)
- The weight of 100 leaves (dry, g)

Data samples were been subjected of statistical analysis of the variance and correlation.

Table 2 The correlation coefficient (Plascak, 1993)

<i>The coefficient (r)</i>	<i>The correlation type</i>
0.0-0.1	there is no correlation
0.1-0.25	very weak correlation
0.25-0.4	weak correlation
0.4-0.5	Medium correlation
0.5-0.75	Strong correlation
0.75-0.9	Very strong correlation
0.9-1	Full correlation

The results and their discussion

In Table 2, are presented the average data of morphological indicators of uva ursi populations during the 2015 in Korab Mountain, Dibër.

From the data from this table, we observe the changes in the morphological characters of uva ursi populations, both from one population to another, both within each population (see analytical Tables). Specifically, the average length of sprig varies from 6.48 cm in population of Borovajku Begjunecit, to 8.48 cm in population of Gropa Stane. The average of this indicator is 7.36 cm. The number of sprigs for

plant varies from 5.75 in Mali i Vrenjtit population, to 8.06 in the Përroi i Pasqyrës population. The average number of sprigs in the studied populations is 6.75 sprig /plant.

Table 3:The average data of morphological indicators of uva ursi populations during the 2015 in Korab Mountain, Dibër.

<i>The features</i>	<i>The length of sprig, (cm)</i>	<i>The number of sprigs/plant</i>	<i>The length of internodes, (cm)</i>	<i>The length of leaf, (cm)</i>	<i>The width of leaf, (cm)</i>	<i>The length of leaf tail, (cm)</i>	<i>The number of leaves/sprig</i>
Gropat e Staneve	8.48	7.39	0.62	2.19	0.81	0.47	14.37
Borovajku i Begjunecit	6.48	5.97	0.47	1.93	0.70	0.41	13.73
Kodrat e Bregut	7.49	7.18	0.48	2.12	0.86	0.37	14.16
Mali i Vrenjtit	7.39	5.72	0.51	2.11	0.85	0.44	13.38
Llofkat e Sllatinës	6.9	6.4	0.47	2.158	0.82	0.45	15.1
Livadhi i gjate	7.23	6.5	0.47	2.16	0.91	0.48	15.08
Përroi i Pasqyres	7.52	8.06	0.49	2.01	0.92	0.44	14.74
The average	7.36	6.75	0.5	2.10	0.84	0.44	14.37

The length of internodes in cm varies from 0.51 cm in Mali i Vrenjtit population, to 0.62 cm in Gropat e Stane population. The average length of internodes in the studied populations is 0.5 cm.

The length of leaf varies from 1.93 cm in Borovajka Begjunecit population, to 2.19 cm in Gropat e Stane population. The average length of leaf in the studied population is 2.10 cm.

The width of leaf in cm varies from 0.70 cm in Borovajku I Begjunecit, to 0.92 cm in Përroi i Pasqyrës population. The average width of leaf in the studied population is 0.84 cm.

The length of leaf tail in cm varies from 0.41 cm in Borovajku Begjunecit population, to 0.48 cm in Livadhi I Gjatë population. The average length of the leaf tail is 0.44 cm.

The number of leaves/sprig varies from 13.38 in Mali i Vrenjtit population, to 15.08 in Livadhi i Gjatë population. The average of the leaves number /sprig is 14.37 leaves.

From these data, we observe a variation which is reflected in all the studied characteristics. But more important it is to know if this variation is significant or random. For this, analysis of variance was performed, which is given in Table 4.

Table 4: The variance analysis of data for plants indicators of Uva Ursi population, Korab 2015

<i>Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Rows	1.71242	5	0.34248	1.83861	0.14168	2.6029874
Columns	918.327	5	183.665	986.001		2.6029874
Error	4.65683	25	0.18627			
Total	924.697	35				

In this table, the rows represent the variation of characteristics in the different sites, while the columns represent the variation of studied indicators. From this table, we see that variation of sites where samples are taken is non-significant, so, it is randomized. This shows that the populations of Uva

Ursi have variation, but this variation is random. Despite that the populations are in different places, they have no major changes in relation to these indicators. Table 5 gives the variation in the indicators for the weight of wet and dry leaves / plant, and the weight of 1000 fresh and dried leaves.

Table 5: The averages indicators of the plant weight for the populations of *Uva ursi*, Korab Mountain 2015

<i>The features</i>	<i>The weight of leaves/plant (fresh, g)</i>	<i>The weight of leaves/plant (dry, g)</i>	<i>The weight of 100 leaves (fresh, g)</i>	<i>The weight of 100 leaves (dry, g)</i>
Gropat e Staneve	3.02	2.03	3	2.1
Borovajku i Begjunecit	1.99	1.41	3	2.2
Kodrat e Bregut	3.18	2.46	4.4	3.3
Mali i Vrenjtit	2.65	1.7	4.4	2.7
Llofkat e Sllatinës	2.59	1.86	4	3.2
Livadhi I Gjatë	3.41	2.46	4.7	3.4
Përroi I Pasqyrës	4.11	2.99	4.5	3.1
Average	2.99	2.12	4	2.86

Note: The calculation are carried for the weight of leaves/plant (dry, g)

DMS 005 (95%) = 0.54 g

DMS 001 (99%) = 0.75 g

These indicators represent the greatest changes than the above indicators. Specifically, the weight of leaf / plant (the fresh, g.) varies from 1.99 g to the Borovajku i Begjunecit population, to 4.11 g to Përroi I Pasqyrës population. The average of plant weight of the populations in Korab Mountain is 2.29 g. The weight of leaf / plant (dry, g.) preserves almost the same legitimacy as well as the fresh plant weight. The average weight of leaf / plant is 2.12 g. Of interest is to know how much is the weight of 100

fresh and dried leaves. This indicator, in comparison with the weight of leaf / plant presents fewer variations from one site to another. Specifically, the weight of 100 leaves (fresh, g.) varies from 3 g to 4.5 g, with an average of 4 g, while the weight of 100 dry leaves varies from 2.1 g to 3.4 g, with an average of 2.86 g.

In Table 6 is presented the analysis of variance of the output indicators data of *uva ursi* populations, Korab 2015.

Table 6: The analysis of variance of the data for the yield indicators of *Uva ursi* populations, Korab 2015.

<i>Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit.</i>
Rows	3.862032	5	0.772406	9.218023	0.001661	3.325835
Columns	12.46071	2	6.230355	74.35406	9.93E-07	4.102821
Error	0.837931	10	0.083793			
Total	17.16067	17				

From this table we observe the significant change, as to the weight of the leaves of a plant, as well as for weight of 100 leaves. This means that we are dealing with significant changes to these indicators from one population to another that was not observed in the case of morphological indicators.

To judge the extent of links between the studied traits was conducted the analysis of correlation links presented in Table 7. The correlation is measured by the correlation coefficients.

When the correlation coefficients emerge from the analysis in Excel are validated for the probability 95% :(+)

From this table we observe strong positive link between the length of the internodes and length of

sprig, with coefficient 0.85; between the sprigs number and sprig length, with coefficient 0.59; between leaf length and leaf tail length, with coefficient 0.45, etc. But what interests us is the correlation with the features related to the production of plant. In this respect there are interesting data: weight of 100 leaves (fresh, g) has the strong correlation with the length of the leaf. Likewise, the weight of 100 leaves (dry, g), the weight of leaf / plant is strongly positively associated with the length of the leaf. This means that these genotypes are more productive. Of course, these are as orientation, because it should be viewed as links to the content of the active substance in *Uva Ursi*.

Table 7: The coefficients correlation of links between some morphological characteristics of *Uva ursi* in Korab Mountain

<i>The features</i>	<i>The length of sprig, (cm)</i>	<i>The number of sprigs/plant</i>	<i>The length of internodes, (cm)</i>	<i>The length of leaf, (cm)</i>	<i>The width of leaf, (cm)</i>	<i>The length of leaf tail, (cm)</i>	<i>The number of leaves/sprig</i>	<i>The weight of leaves/plant (fresh, g)</i>	<i>The weight of leaves/plant (dry, g)</i>	<i>The weight of 100 leaves (fresh, g)</i>	<i>The weight of 100 leaves (dry, g)</i>
The length of sprig, (cm)	1										
The number of sprigs/plant	0.59+	1									
The length of internodes, (cm)	0.85+	0.30									
The length of leaf, (cm)	0.59+	0.08	0.41	1							
The width of leaf, (cm)	0.39	0.47	-0.09	0.45+	1						
The length of leaf tail, (cm)	0.30	-0.01	0.41	0.45+	0.27	1					
The number of leaves/sprig	0.06	0.45	-0.14	0.40	0.48+	0.47+	1				
The weight of leaves/plant (fresh, g)	0.49+	0.81+	0.06	0.20	0.87	0.20	0.51+	1			
The weight of leaves/plant (dry, g)	0.38	0.83+	-0.08	0.13	0.83+	0.05	0.56+	0.97+	1		
The weight of 100 leaves (fresh, g)	-0.07	0.11	0.53+	0.22	0.86+	0.01	0.30	0.61+	0.61+	1	
The weight of 100 leaves (dry, g)	-0.21	0.17	0.63+	0.27	0.74+	-0.07	0.57+	0.53	0.61+	0.89+	1

Conclusions

By the study of variation of *Uva Ursi* (*Arctostaphylos uva-ursi* L.) in Korabi Mountain based on some morphological indicators we get these conclusions:

Important variation is observed in case of patterns that have to do with leaf's weight of a wet and a dry plant and the weight of 100 leaves with leaf's width. This allows to apply a program of selection in this plant.

Obvious variation present the correlative connections between the studied patterns. With interest are the connections which exist between the leaves' production per plant and leaf's width.

6. References

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