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Comparative biometric characteristics of the organs in the female part of the flower in seedless varieties of vines (*Vitis vinifera* L.)

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Abstract

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A comparative biometric characterization of the organs in the female part of the flower was performed in a large group of seedless varieties of vines. It has been established that, depending on the degree of their biometric similarity at the base of the inflorescence, the studied seedless varieties of vines form six generalized clusters, three in the middle and five in the upper parts – at the top, the majority of which consist of sub-clusters, gathered at the respective Euclidean distance. The use of the two mathematical-statistical methods – hierarchical cluster analysis and single-factor analysis of variance allows the obtaining of statistically reliable information about the importance of the individual components of the vine flower in the grouping of the seedless varieties of vines. The established differences in the parameters of the organs from the female part of the flower confirm the non-simultaneous morphological and cytoembryological development of the flower buttons depending on the variety, as well as the enormous polymorphism in this group of varieties.

Keywords: seedless varieties of vines; flower organs; comparative biometric characterization; cluster analysis; dispersion analysis

Introduction

The morphological and cytoembryological characteristics of the flower distinguish seedless from seed varieties of vines and have a significant influence on the quantity and quality of the yield. The parameters of structural elements in the female part of the flower are part of the botanical characteristic of each vine variety and are used in comparative ampelographic observations and identification of different types and varieties of vines. Their biometric diversity is a reflection the ampelographic specificity of the individual varieties and the genotype-environment interaction. Kozma (1957, 1957) found that, depending on the pruning, the pistil may lag in its development as compared to stamens and the fertilization can improve.

In comparative ampelographic studies, the drawings and photographs of the flowers are most credible, but the indicators with the greatest value are the size and shape of the pistil (Ryabova, 1986; Panarina, 1970, 1971, 1974). The flower organs of the Amour vine show significant polymorphism (Chebukin, 1997).

It is known that the parthenocarpy of the vine is determined by substantial changes in the female part of the flower and any new information related to this biological phenomenon will provide greater opportunities for enhancing the effectiveness of its practical application (Roychev, 1996; 2008).

Vine-growing uses more and more different mathematical methods for determining the authenticity of the experimental results obtained (Keranova & Roychev, 2018). Significantly less is their use in studies related to ampelometric data reflecting the flower components in individual varieties of vines. The purpose of this study is to identify the possibilities for grouping and comparative analysis of the biometric

characteristics of the organs in the female part of the flower in seedless varieties of vines by using different mathematical approaches.

Material and Methods

The experimental study includes 50 seedless varieties of vines, cultivated in the Ampelographic assortment of the Department of Vine Growing at the Agricultural University of Plovdiv. For five consecutive years, 100 measurements of the parameters of the female organs of the flower (mm) were performed, including the following indicators: length and width of the flower stem, button, bed (diameter and height), pistil and pistil along with the style. The flower buttons are collected in the flowering phenophase. (Roychev, 2012). The inflorescence is conditionally divided horizontally into three parts: base – covers the first few branches; middle – the branches in the middle sector; top – the upper parts of the inflorescence.

A hierarchical cluster analysis is used to identify relatively homogeneous groups of objects (Everitt, 1979; Murphy et al., 1986; Rossilo et al., 1999; Gonzales Techera et al., 2004; Perestrelo et al., 2014). The clustering procedure was performed by the inter-group binding method, and the quadratic Euclidean distance was chosen for a measure of similarity (Dubles & Jain, 1980; Landau & Everitt, 2004). Dendrograms were constructed to graphically present the phased clustering of the individual objects (Yuncong et al., 1995; Varga et al., 2006).

After using the Levene homogeneity test, it was found that the experimental data were of equal dispersion and could be compared based on the selected indicators. The overall mathematical assessment for each of the analyzed groups of signs of the tested seedless varieties has a significance level less than the error $\alpha = 0.05$, which is sufficient to assume that they have proven differences and the common pattern is statistically significant.

Since the cluster analysis does not include statistical significance tests, it is combined with a single-factor analysis of variance (ANOVA) and a Duncan test. The comparative assessment of the seedless varieties of vines was carried out through the obtained rank assessments, expressed in letters, for the presence of reliable differences between the average values of the surveyed indicators. The presence of overlapping ranks, albeit not entirely, proves the proximity of the respective varieties, and the different alphabetic indications –the statistical differences between them. The mathematical data processing uses the statistical method IBM Statistics SPSS 25 (Field, 2013; Meyers et al., 2013; Weinberg et al., 2015; Ganeva, 2016).

Results and Discussion

Depending on the degree of similarity of the studied organs in the female part of the flower at the base of the inflorescence in its horizontal division, the seedless varieties are grouped into six generalized clusters (Figure 1). The first one consists of four sub-clusters, including different number of varieties. The first sub-cluster includes Askery, Korsa kishmish, Tarnow, Focha seedless, Vanessa seedless, Italia x

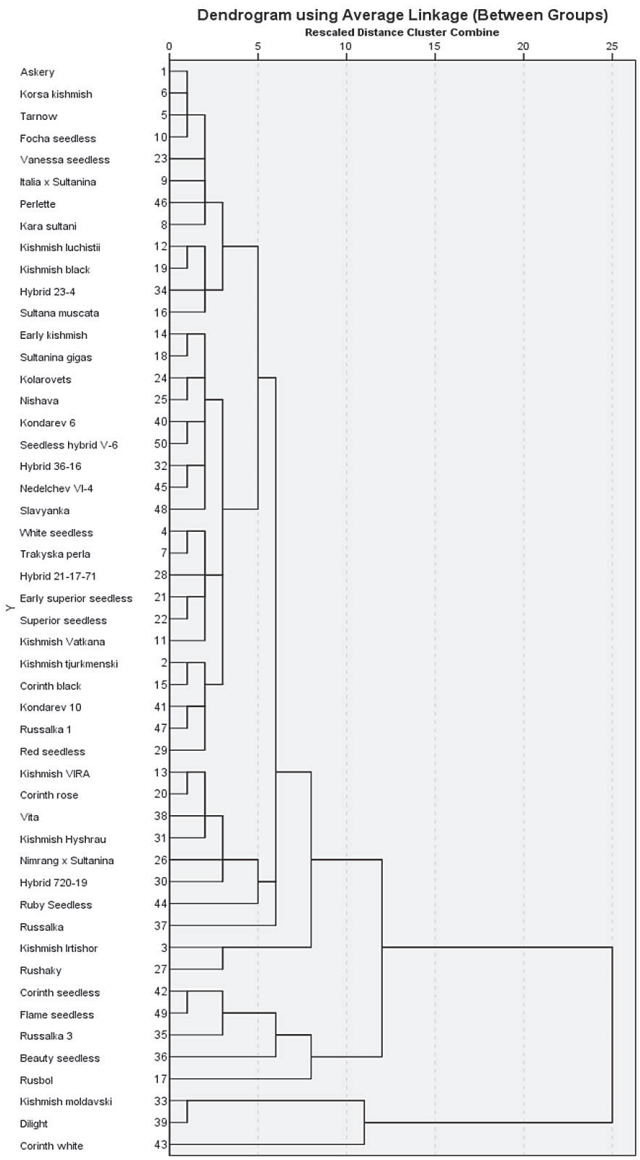

Fig. 1. Grouping of the studied seedless varieties of vines by the organs in the female part of the flower in the horizontal division of the inflorescence – base

Sultanina, Perlette, Kara sultani, Kishmish luchistii, Kishmish black, Hybrid 23-4 and Sultana muscata, which have similarity in the stem length, flower button width, diameter of the flower bed, with the smallest diameter of the flower bed and one of the smallest width of the flower button.

The second sub-cluster consists of Early kishmish, Sultanina gigas, Kolarovets, Nishava, Kondarev 6, Seedless hybrid V-6, Hybrid 36-16, Nedelchev VI-4 and Slavyanka, where the length of the stem of the flower button is the smallest, and there is biometric proximity in the indicators – length of the flower button and pistil and pistil width.

The third sub-cluster includes White seedless, Trakyska perla, Hybrid 21-17-71, Early superior seedless, Superior seedless and Kishmish Vatkana, which have small stem length, similar stem width and maximum size of the flower button and the pistil. The varieties Kishmish tjurkmenski, Corinth black, Kondarev 10, Russalka 1 and Red seedless form the fourth sub-cluster. They are characterized by a relatively small length of the flower button, as well as long pistil and style. There is a similarity in the length of the stem of the flower button.

Due to the large diameter of the flower bed and the small width of the pistil, the second generalized cluster includes Kishmish VIRA, Corinth rose, Vita, Kishmish Hyshrau, Nimrang x Sultanina, Hybrid 720-19, Ruby Seedless and Russalka. Kishmish Irtishor and Rushaky which have the greatest widths of the stem and pistil are separated into a third independent cluster. Corinth seedless, Flame seedless, Russalka 3, Beauty seedless and Rusbol form a fourth-cluster of a higher level due to the presence of a minimum diameter and a maximum height of the flower bed. Kishmish moldavski and Dilight, have the largest lengths of the stem of the flower button, which determines their separation in a fifth cluster. Corinth white forms the sixth independent cluster due to proven differences in the measured indicators with the other studied varieties.

The studied indicators reported in the middle of the inflorescence medium group the varieties into three generalized clusters, which consist of sub-clusters, united at the corresponding Euclidean distance (Figure 2). The first subcluster includes the varieties with small stem of the flower button and diameter of the flower bed – Tarnow, Focha seedless, Vanessa seedless, Kara sultani, Kishmish Hyshrau, Ruby Seedless, Sultanina gigas, Askery, Korza kishmish, Kolarovets, Russalka and Nishava. The second sub-cluster includes Kishmish Vatkana and Kishmish luchistii, which have a small diameter of the flower bed and close sizes of stem length and length and width of the flower button.

The varieties of the third sub-cluster are characterized with a small length of stem of the flower button – Kishmish tjurkmenski, Early superior seedless, Hybrid 36-16, Kondarev 6, Kishmish Irtishor, Superior seedless, Trakyska perla, Kishmish VIRA, Red seedless, White seedless and Rushaky. Hybrid 21-17-71 is in a separate sub-cluster, but can join the generalized cluster at an Euclidean distance of two units. The varieties Early kishmish, Славянка, Sultana muscata, Kishmish black, Hybrid 23-4 and Vita form the next sub-clus-

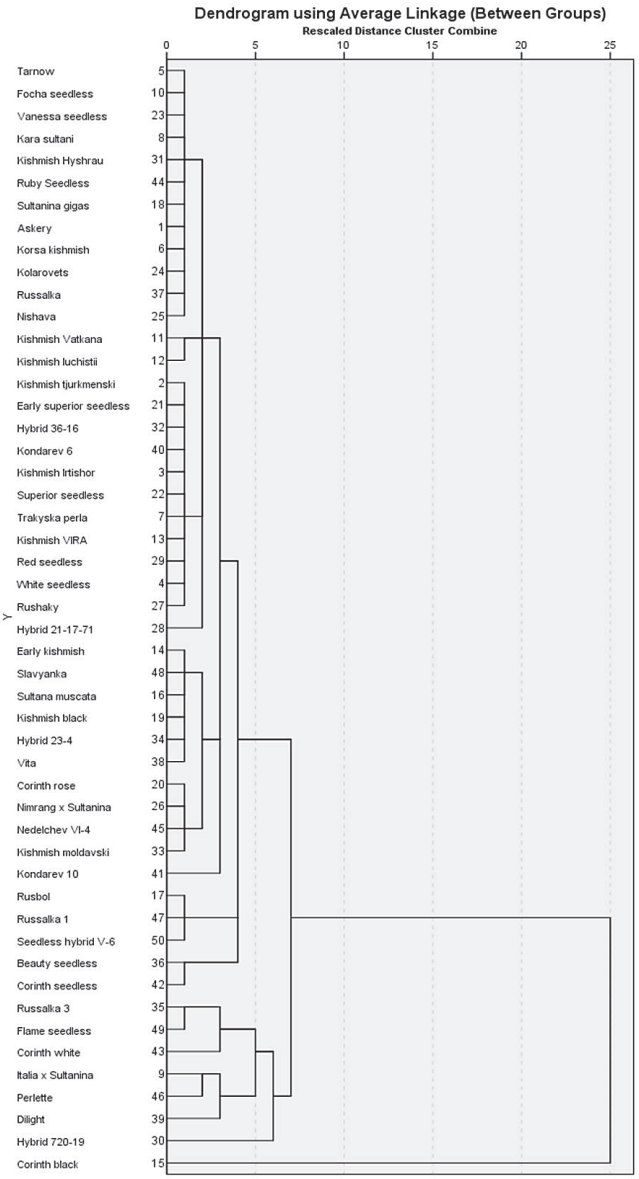

Fig. 2. Grouping of the studied seedless varieties of vines by the organs in the female part of the flower in the horizontal division of the inflorescence – middle

ter due to close values of the indicators width of the flower button and height of the flower bed. With approximately the same size of the width of the flower bed and pistil and pistil and style are Corinth rose, Nimtang x Sultanina, Nedelchev VI-4 and Kishmish moldavski.

The two sub-clusters described can be considered as a generalized second cluster at a distance of two Euclidean units. Kondarev 10 forms a separate sub-cluster having a minimum height of the flower bed and maximum dimensions of the pistil and is the first variety of the third generalized cluster. Rusbol, Russalka 1 and Seedless hybrid V-6 form an independent sub-cluster due to the small diameter of the flower bed. The varieties Beauty seedless and Corinth seedless have similarity regarding the stem of the flower-button – width, flower button – length, flower bed – diameter and height, and pistil – length, which unites them in the next sub-cluster.

Russalka 3, Flame seedless and Corinth white are in another sub-cluster because they have a minimum diameter of the flower bed. The next sub-cluster is formed by Italia x Sultanina, Perlette and Dilight which are similar based on the width of the stem of the flower button. Hybrid 720-19, with maximum sizes of the flower button and Corinth black, with minimal flower button sizes and flower button stem, form single sub-clusters. The former joins the others at a distance of seven Euclidean units, showing some similarity to the other varieties from the previous sub-cluster. Corinth black forms a sub-cluster, distanced at a maximum Euclidean distance of 25 units, which means that it is very different from the group of varieties based on the surveyed indicators.

Based on the same indicators, in the upper parts of the inflorescence, the studied varieties are arranged in the five generalized clusters (Figure 3). The first of them combines eight sub-clusters, one of which includes Hybrid 23-4, Russalka и Nymrang x Sultanina. They are characterized by similarity in the length of the stem and length of the flower button, width of the pistil (smaller compared to the others) and of the pistil and style. Sultana muscata forms a separate sub-cluster.

Due to their similarity in the length of the stem of the flower button and pistil and style, the next one includes Kishmish tjurkmenski, Slavyanka, Hybrid 36-16, Kondarev 6 and Kishmish black. Separate sub-clusters include the varieties Corinth black, Sultanina gigas and Kishmish VIRA – similar in the length of the stem of the flower button and the height of the flower bed.; the varieties Korsa kishmish, Kishmish Vatkana, Ruby Seedless and Focha seedless – similar in the length of the stem, width of the pistil and pistil and style; Tarnow, Vita, Kishmish luchistii and Askery – having the same diameter of the flower bed and the same length of the pistil. Sub-clusters are formed by the varieties Nedelchev VI-4 и Hybrid seedless V-6 – having similar parameters of the width of the stem of the flower button, the length and height of the flower bed and Kara sultani and Vanessa seedless – with small length of the flower button, length of the pistil and pistil and style, width of the flower button and diameter of the flower bed.

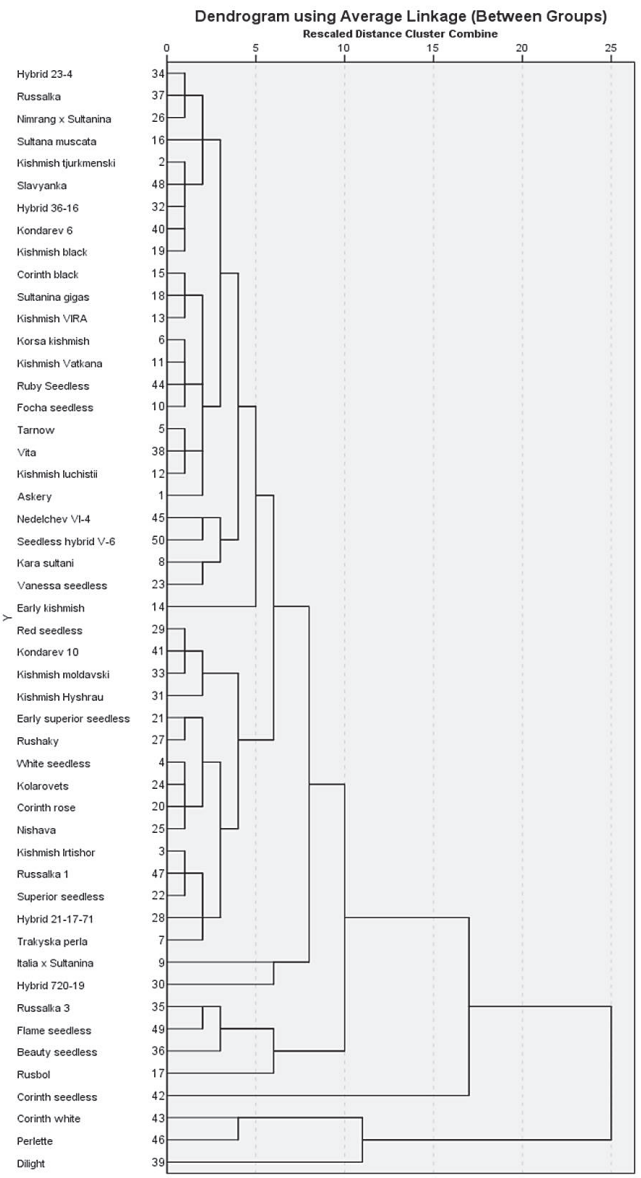

Fig. 3. Grouping of the studied seedless varieties of vines by the organs in the female part of the flower in the horizontal division of the inflorescence – top

Table 1. Multidirectional comparative assessment of the seedless varieties of vines based on the studies indicators in the female part of the flower by the Duncan method in the horizontal division of the inflorescence – base, mm

Cluster	Seedless varieties	Flower button stem		Flower button		Flower bed		Pistil		Pistil and style
		length	width	length	width	diameter	height	length	width	length
I	Askery	1.69 nopqrs	0.35 efghijkl	2.42 klmnopqr	1.98 lmn	1.18 opq	0.23 rs	1.87 defghi	1.19 uvwx	2.4 fghijklm
	Korsa kishmish	1.92 ijklmnopqr	0.41 bcde	2.39 lmnopqr	1.82 opq	1.3 klmnop	0.30 opqrs	1.48 nopq	1.23 tuvwx	2.08 opqrst
	Tarnow	2.07 ghijklmnpoqr	0.27 klmno	2.46 ijklmnop	1.65 rs	1.18 opq	0.31 opqr	1.63 jklmn	1.19 uvwx	2.24 klmnop
	Focha seedless	1.98 hijklmnopqr	0.36 defghi	2.38 lmnopqr	1.58 st	1.58 defgh	0.27 qrs	1.46 nopq	1.25 stuvwx	2.17 mnopqr
	Vanessa seedless	1.65 qrs	0.49 b	2.24 opqrs	1.87 nop	1.38 ijklmn	0.48 defghij	1.46 nopq	1.28 stuvwx	1.80 uv
	Italia x Sultanina	1.97 ijklmnopqr	0.30 hijklmno	2.71 fghij	1.79 pqr	1.05 q	0.43 ghijklmn	1.23 rst	1.17 wx	1.86 tuv
	Perlette	2.32 fghij	0.30 hijklmno	2.15 rs	1.48 t	1.14 pq	0.21 s	1.39 pqr	1.14 x	1.98 qrstu
	Kara sultani	2.18 ghijklmn	0.23 o	2.22 pqrs	1.75 pqr	1.5 efghij	0.47 defghijkl	1.33 qrs	1.7 defghij	1.96 rstu
	Kishmish luchistii	2.34 efghij	0.44 bcd	2.64 ghijkl	2.02 ijklm	1.21 nop	0.37 klmnpoq	1.5 mnopq	1.18 vwx	2.14 nopqr
	Kishmish black	2.38 efghi	0.28 jklmno	2.64 ghijkl	1.99 klmn	1.47 efghijk	0.42 hijklmn	1.47 nopq	1.34 qrstuv	2.35 hijklmn
	Kolarovets	1.87 jklmnopqrs	0.28 ijklmno	2.51 hijklmno	1.94 mno	1.33 jklmno	0.37 klmnpoq	1.65 jklmn	1.34 pqrstuv	2.60 defg
	Sultana muscata	2.47 defgh	0.26 lmno	2.84 cdefg	1.60 st	1.23 mnop	0.40 ijklmno	1.58 lmnop	1.56 hijklm	2.35 ghijklm
	Early kishmish	1.62 rs	0.26 lmno	2.17 qrs	1.99 klmn	1.22 nop	0.30 opqrs	1.75 hijkl	1.50 lmnopq	2.46 efghijk
	Sultanina gigas	1.42 s	0.30 hijklmno	2.38 lmnopqr	1.67 rs	1.3 lmnop	0.42 hijklmn	1.64 jklmn	1.54 jklmno	2.41 fghijklm
	Hybrid 23-4	1.87 jklmnopqrs	0.28 ijklmno	2.51 hijklmno	1.94 mno	1.33 jklmno	0.37 klmnpoq	1.65 jklmn	1.34 pqrstuv	2.60 defg
	Nishava	1.77 mnopqrs	0.31 ghijklmno	2.6 ghijklmn	2.06 hijkl	1.15 pq	0.39 klmnop	2.05 abcd	1.51 klmnopq	2.68 bcd
	Kondarev 6	1.67 pqrs	0.36 defghijk	2.46 jklmnop	2.17 fghi	1.61 cdef	0.62 ab	1.60 klmnop	1.49 lmnopq	2.40 fghijklm
	Seedless hybrid V-6	1.69 opqrs	0.40 cdef	2.78 defgh	2.2 efgh	1.5 efghij	0.54 bcdef	1.46 nopq	1.83 bcde	2.34 hijklmn
	Hybrid 36-16	2.05 ghijklmnpoqr	0.37 cdefgh	2.5 hijklmno	2.36 cd	1.48 efghij	0.45 fghijkl	1.70 ijklm	1.51 klmnop	2.30 hijklmno
	Nedelchev VI-4	2.17 ghijklmno	0.33 efghijkl	2.51 hijklmno	2.25 defg	1.53 efghi	0.53 bcdefg	1.53 mnopq	1.50 lmnopq	2.25 jklmnop
	Slavyanka	1.97 ijklmnpoqr	0.24 no	2.31 nopqrs	1.97 lmn	1.24 mnop	0.39 klmnop	1.65 klmn	1.61 ghijklmn	2.24 klmnop
	White seedless	1.80 klmnopqrs	0.36 defghijk	3.03 bcd	2.09 hijkl	1.77 b	0.59 abc	1.78 fghijkl	1.79 bcdefg	2.43 fghijkl
	Trakyska perla	2.22 ghijklm	0.38 cdefgh	3.04 abcd	2.04 hijkl	1.71 bcd	0.51 cdefgh	1.81 efghijk	1.81 bcdef	2.44 fghijkl
	Hybrid 21-17-41	2.24 ghijklm	0.35 efghijkl	3.03 bcd	2.14 ghijk	1.59 defg	0.57 abcd	2.10 abc	1.90 bc	2.70 cd
	Early superior seedless	2.05 ghijklmnopqr	0.41 bcde	2.70 fghijk	2.31 def	1.38 ijklmn	0.37 klmnpoq	2.13 abc	1.67 efghijkl	2.53 defghi
	Superior seedless	1.85 jklmnopqrs	0.40 cdef	2.96 bcdef	2.14 ghijk	1.38 ijklmn	0.42 hijklmn	2.00 bcde	1.72 defghi	2.48 defghij
	Kishmish Vatkana	2.13 ghijklmnopq	0.40 cdef	3.10 ab	2.06 hijkl	1.44 fghijkl	0.31 nopqr	1.97 cdefg	1.79 bcdef	2.11 opqrs
	Kishmish tjurkmenski	2.38 efghi	0.25 mno	2.14 rs	1.77 pqr	1.43 ghijkl	0.31 nopqr	1.89 defghi	1.66 fghijklm	2.41 fghijklm
	Corinth black	2.11 ghijklmnopq	0.26 lmno	2.32 mnopqr	2.02 ijklm	1.33 jklmno	0.29 defghi	2.02 bcd	1.70 defghi	2.56 defgh
	Kondarev 10	2.39 efghi	0.35 efghijkl	2.51 hijklmno	2.16 ghij	1.37 ijklmn	0.37 klmnpoq	1.98 bcdef	1.93 b	2.69 cd
	Russalka 1	2.26 ghijkl	0.41 bcde	2.62 ghijkl	2.01 jklmn	1.69 bcd	0.45 fghijkl	1.77 ghijkl	1.86 bcd	2.70 cd
	Red seedless	2.07 ghijklmnpoqr	0.40 cdef	2.53 hijklmno	2.07 hijkl	1.61 bcde	0.51 cdefgh	2.09 abc	1.5 lmnopq	2.84 bc

Table 1. Continued

II	Kishmish VIRA	2.52^{defg}	0.46^{bc}	2.78^{defgh}	2.56^{ab}	1.61^{bcde}	$0.37^{klmnpoq}$	1.66^{jklmn}	1.35^{pqrstu}	$2.38^{ghijklm}$
	Corinth rose	2.39^{efghi}	0.37^{defghi}	3.00^{bcde}	2.37^{cd}	$1.45^{efghijkl}$	$0.45^{fghijkl}$	$1.77^{fghijkl}$	1.56^{ijklmn}	$2.40^{fghijklm}$
	Vita	$1.96^{ijklmnopqr}$	0.36^{defghi}	2.63^{ghijkl}	2.16^{ghij}	1.38^{ijkl}	$0.48^{defghij}$	1.09^{t}	1.41^{nopqrs}	1.81^{uv}
	Kishmish Hyshrau	2.87^{bcd}	$0.36^{defghij}$	2.85^{cdefg}	2.16^{ghij}	$1.45^{efghijkl}$	$0.44^{fghijklm}$	1.51^{mnopq}	$1.61^{hijklmn}$	2.09^{opqrst}
	Nymrang x Sultanina	3.09^{bc}	0.44^{bcd}	3.09^{ab}	2.70^{a}	1.36^{ijklmn}	0.56^{abcde}	$1.79^{fghijkl}$	1.47^{mnopqr}	2.45^{fghijk}
	Hybrid 720-19	2.96^{bc}	0.24^{no}	3.17^{ab}	2.46^{bc}	1.42^{ghijkl}	0.61^{ab}	1.41^{opqr}	1.23^{tuvwx}	1.89^{stuv}
	Ruby Seedless	2.74^{cdef}	0.38^{cdefgh}	$2.44^{jklmnopq}$	1.74^{pqr}	1.35^{jklmno}	0.54^{bcdef}	2.17^{ab}	1.48^{mnopq}	2.00^{qrstu}
	Russalka	2.27^{fghijk}	0.41^{bcde}	2.04^{s}	2.58^{ab}	2.14^{a}	0.34^{mnopqr}	1.69^{jklm}	1.31^{rstuvw}	2.21^{lmnopq}
III	Kishmish Irtishor	$2.1^{ghijklmnopqr}$	0.61^{a}	2.78^{defgh}	2.33^{cde}	1.75^{bc}	0.57^{abcd}	2.24^{a}	2.18^{a}	3.00^{ab}
	Rushaky	$1.75^{mnopqrs}$	0.65^{a}	3.30^{a}	2.61^{a}	$1.44^{fghijkl}$	$0.46^{fghijkl}$	2.24^{a}	1.80^{bcdef}	2.85^{bc}
IV	Corinth seedless	2.52^{defg}	$0.30^{hijklmno}$	2.31^{nopqrs}	2.11^{ghijkl}	1.40^{ijklm}	0.28^{qrs}	1.58^{lmnop}	$1.68^{efghijk}$	2.08^{opqrst}
	Flame seedless	2.27^{fghijk}	0.27^{klmno}	$2.61^{ghijklm}$	2.04^{hijkl}	1.40^{ijklm}	0.29^{pqrs}	1.63^{jklmn}	1.75^{cdefgh}	2.14^{nopqr}
	Russalka 3	3.24^{b}	$0.35^{efghijkl}$	$2.46^{jklmnop}$	2.17^{fghi}	1.41^{hijkl}	$0.47^{defghijkl}$	1.61^{jklmno}	1.46^{mnopqr}	2.12^{nopqrs}
	Beauty seedless	$1.77^{lmnopqrs}$	0.39^{cdefg}	2.19^{pqrs}	2.01^{jklmn}	1.43^{ghijkl}	0.54^{bcdef}	1.19^{st}	1.23^{tuvwx}	1.72^{v}
	Rosbul	$2.16^{ghijklmnop}$	0.24^{no}	2.75^{efghi}	1.77^{pqr}	1.29^{klmnop}	$0.47^{defghijkl}$	1.96^{cdefg}	1.46^{mnopqr}	3.07^{a}
V	Kishmish moldavski	4.41^{a}	$0.32^{fghijklm}$	3.05^{bc}	1.68^{qrs}	$1.35^{ijklmno}$	0.39^{klmnop}	1.95^{cdefgh}	1.29^{stuvwx}	$2.44^{fghijkl}$
	Dilight	4.72^{a}	$0.31^{ghijklmno}$	2.94^{bcdef}	1.79^{pqr}	1.38^{ijklmn}	0.65^{a}	1.81^{efghij}	1.37^{opqrst}	2.63^{cdef}
VI	Corinth white	4.57^{a}	0.40^{cdef}	$2.42^{jklmnopqr}$	2.46^{bc}	$1.46^{efghijkl}$	$0.48^{defghij}$	1.52^{mnopq}	1.83^{bcde}	2.05^{pqrst}

a,b,c,… – degree of proof at a level of significance $\alpha = 0.05$

The first generalized cluster is also joined by Early kishmish, which forms a separate sub-cluster as it is characterized by comparatively small organs of the female part of the flower at the top of the inflorescence, except the length of the pistil and pistil and style, which are proved to be different from these of the other studied seedless varieties.

The second generalized cluster is formed by three sub-clusters, the first of which including Red seedless, Kondarev 10, Kishmish moldavski and Kishmish Hyshrau, having similarity in the length of the stem of the flower button and pistil and style.

In the next sub-cluster there are two subgroups, consisting of Early superior seedless and Rushaky – with similar length of the stem of the flower button and diameter of the flower bed, width of the pistil and pistil and style, and White seedless, Kolarosets, Corinth rose and Nishava with smaller length of the stem of the flower button and similar height of the flower bed. Due to similarity in the width of the pistil and pistil and style (larger than the rest), the varieties Kishmish Irtishor, Russalka 1, Superior seedless, Hybrid 21-17-71, Trakyska perla, Italia x Sultanina and Hybrid 720-19 form a third sub-cluster that joins the others at a distance of two Euclidean units.

The third generalized cluster consists of two sub-clusters. The first of them includes Russalka 3, Flame seedless and Beauty seedless, which are characterized by higher flower bed and have similarity in length and width of the stem and the length of the flower button, while Rusbol forms the second sub-cluster. Dilight and Perlette have long pistil and style, and Corinth seedless – the minimum length and width of the pistil and the style. Corinth white also has small size of the pistil, but its flower bed has a larger diameter. All of this determines the separation of these seedless varieties into two generalized clusters.

Concerning the base of the inflorescence, Dilight has the longest stem of the flower button (4.72 mm) and Sultanina gigas – the shortest (1.42 mm). Rushaky has the maximum width (0,65 mm) and Kara sultani – the minimal (0.23 mm) (Table 1). Rushaky has the longest flower button (3.3 mm) and Kishmish tjurkmenski – the smallest (2.14 mm). Nymrang × sultanina has the highest values of the width of the flower button (2.7 mm), and Perlette – the smallest (1.48 mm). Russalka has the largest diameter of the flower bed (2.14 mm), and Italia x Sultanina – the smallest (1.05 mm). Dilight has the highest flower bed of all other varieties (0.65mm) and Perlette has the lowest (0.21mm).

Kishmish Irtishor and Rushaky have the longest pistil (2.24 mm), and Vita has the shortest – (1.09 mm). Kishmish Irtishor also has the widest pistil (2.18 mm) and Perlette – the narrowest (1.14 mm). Rusbol has the largest length of

Table 2. Multidirectional comparative assessment of the seedless varieties of vines based on the studies indicators in the female part of the flower by the Duncan method in the horizontal division of the inflorescence – middle, mm

Cluster №	Seedless varieties	Flower button stem		Flower button		Flower bed		Pistil		Pistil and style
		length	width	length	width	diameter	height	length	width	length
I	Tarnow	1.70^{stuvwx}	0.23 ^{qrstu}	2.42 ^{klmnopqrs}	1.61 ^{qrs}	1.08 ^{u}	0.26 ^{p}	1.54 ^{lmno}	1.02 ^{s}	2.08 ^{no}
	Focha seedless	1.69 ^{stuvwx}	0.30^{klmnopq}	2.32 ^{opqrst}	1.52 st	1.05 ^{u}	0.22 ^{p}	1.42 ^{no}	1.16 ^{rs}	2.09 ^{no}
	Vanessa seedless	1.51 ^{vwx}	0.34 ^{ghijklm}	2.18 ^{tuv}	1.85 ^{lmno}	1.39 ^{ijklmnop}	0.49 ^{ghijkl}	1.56 ^{klmno}	1.10^{s}	1.84 ^{pq}
	Kara sultani	1.80^{opqrstuvw}	0.23 ^{rstu}	2.19 ^{tuv}	1.71 ^{opqr}	1.34 ^{jklmnopq}	0.36 ^{no}	1.19 ^{p}	1.5 ^{ijklmno}	1.76 ^{qr}
	Kishmish Hyshrau	1.76 ^{rstuvwx}	0.29 ^{lmnopqrs}	2.37 ^{nopqrst}	1.83 ^{lmno}	1.63 ^{cde}	0.49 ^{ghijk}	1.52 ^{mno}	1.56 ^{hijkl}	2.14 ^{lmno}
	Ruby Seedless	1.60^{stuvwx}	0.38 ^{efghij}	2.44 ^{klmnopqr}	1.78 ^{mnop}	1.35 ^{jklmnopq}	0.52 ^{fghi}	1.38 ^{o}	1.52 ^{ijklmn}	2.11 ^{no}
	Sultanina gigas	1.68 ^{stuvwx}	0.23 ^{qrstu}	2.09 ^{uv}	1.44 ^{t}	1.13 ^{tu}	0.38 ^{mn}	1.58 ^{jklmn}	1.45 ^{jklmnop}	2.20^{jklmno}
	Askery	1.59 ^{tuvwx}	0.34 ^{fghijklm}	2.29 ^{pqrstu}	1.91 ^{ijklm}	1.16 ^{stu}	0.22 ^{p}	1.74 ^{fghijkl}	1.16 ^{rs}	2.35 ^{hijklm}
	Korsa kishmish	1.79 ^{pqrstuvw}	0.34 ^{fghijklmn}	2.48 ^{ijklmno}	1.76 ^{mnopq}	1.30^{nopqr}	0.26 ^{p}	1.68 ^{ghijklm}	1.27 ^{qr}	2.22 ^{jklmn}
	Kolarovets	1.66 ^{stuvwx}	0.26 ^{opqrstu}	2.67 ^{fghij}	1.90^{ijklm}	1.16 ^{stu}	0.42 ^{jklmn}	1.68 ^{ghijklm}	1.15 ^{rs}	2.55 ^{efgh}
	Russalka	2.04 ^{mnopqrs}	0.29 ^{lmnopqrs}	2.44 ^{klmnopqr}	2.10^{defgh}	1.33 ^{klmnopq}	0.36 ^{no}	1.78 ^{efghij}	1.28 ^{pqr}	2.27 ^{ijklmn}
	Nishava	1.53 ^{uvwx}	0.29 ^{lmnopqrs}	2.55 ^{hijklmn}	2.03 ^{fghijk}	1.09 ^{u}	0.36 ^{no}	2.01 ^{cd}	1.50^{ijklmn}	2.64 ^{def}
	Kishmish Vatkana	1.95 ^{mnopqrstu}	0.34 ^{fghijklm}	3.04 ^{bc}	2.02 ^{ghijk}	1.38 ^{jklmnopq}	0.35 ^{no}	1.73 ^{fghijkl}	1.82 ^{cde}	2.13 ^{mno}
	Kishmish luchistii	2.21 ^{klmnopq}	0.45 ^{d}	2.82 ^{def}	2.16 ^{defg}	1.32 ^{lmnopq}	0.35 ^{no}	2.01 ^{cd}	1.37 ^{mnopq}	2.50^{fgh}
	Kishmish tjurkmenski	1.64 ^{stuvwx}	0.34 ^{ghijklm}	2.46 ^{jklmnopq}	2.05 ^{fghij}	1.45 ^{hijkl}	0.36 ^{no}	1.89 ^{def}	1.71 ^{defgh}	2.55 ^{efgh}
	Early superior seedless	1.78 ^{qrstuvwx}	0.41 ^{def}	2.63 ^{fghijk}	2.25 ^{cde}	1.51 ^{efghi}	0.48 ^{ghijkl}	1.83 ^{defghi}	1.76 ^{cdefg}	2.62 ^{efg}
	Hybrid 36-16	1.80^{opqrstuvw}	0.41 ^{defg}	2.4 ^{lmnopqrs}	2.20^{cdefg}	1.85 ^{ab}	0.48 ^{ghijkl}	1.86 ^{defgh}	1.86 ^{bcd}	2.62 ^{edf}
	Kondarev 6	1.90^{nopqrstuv}	0.38 ^{efghij}	2.43 ^{klmnopqr}	2.16 ^{defg}	1.59 ^{def}	0.58 ^{ef}	1.65 ^{hijklm}	1.75 ^{cdefg}	2.50^{fgh}
	Kishmish Irtishor	1.88 ^{nopqrstuv}	0.52 ^{c}	2.61 ^{fghijkl}	2.21 ^{cdef}	1.70^{cd}	0.53 ^{efgh}	2.00^{cd}	2.00^{b}	2.94 ^{ab}
	Superior seedless	1.50^{vwx}	0.56 ^{bc}	2.78 ^{efg}	2.35 ^{bc}	1.58 ^{defg}	0.48 ^{ghijkl}	2.25 ^{b}	1.92 ^{bc}	2.84 ^{abcd}
	Trakyska perla	2.21 ^{klmnop}	0.42 ^{de}	3.09 ^{bc}	2.04 ^{fghij}	1.37 ^{jklmnopq}	0.47 ^{hijkl}	1.96 ^{de}	1.81 ^{cde}	2.65 ^{cdef}
	Kishmish VIRA	2.13 ^{lmnopqr}	0.43 ^{de}	2.68 ^{fghi}	2.19 ^{cdefg}	1.38 ^{jklmnopq}	0.40^{lmn}	1.81 ^{defghi}	1.63 ^{fghij}	2.68 ^{cdef}
	Red seedless	2.30^{jklmn}	0.37 ^{efghijk}	2.59 ^{ghijklm}	2.09 ^{efgh}	1.47 ^{fghij}	0.46 ^{hijklm}	2.17 ^{bc}	1.99 ^{b}	2.94 ^{ab}
	White seedless	1.43 ^{wx}	0.39 ^{defgh}	3.10^{bc}	2.10^{defgh}	1.87 ^{a}	0.56 ^{efg}	1.86 ^{defgh}	1.85 ^{bcd}	2.44 ^{fghi}
	Rushaky	1.67 ^{stuvwx}	0.59 ^{b}	3.16 ^{b}	2.51 ^{ab}	1.34 ^{jklmnopq}	0.41 ^{klmn}	2.21 ^{b}	1.76 ^{cdefg}	2.75 ^{bcde}
	Hybrid 21-17-71	1.36 ^{x}	0.34 ^{ghijklm}	2.96 ^{cde}	2.14 ^{defgh}	1.74 ^{bc}	0.59 ^{a}	2.52 ^{a}	2.28 ^{a}	3.00^{a}
	Early kishmish	2.33 ^{ijklm}	0.22 ^{tu}	2.07 ^{v}	1.87 ^{klmno}	1.42 ^{hijklmn}	0.26 ^{p}	1.94 ^{def}	1.62 ^{ghijk}	2.50^{fgh}
	Slavyanka	2.21 ^{klmnopq}	0.28 ^{lmnopqrst}	2.4 ^{lmnopqrs}	1.96 ^{hijkl}	1.18 ^{rstu}	0.29 ^{op}	1.80^{defghi}	1.6 ^{ghijk}	2.50^{fgh}
	Sultana muscata	2.70^{fghi}	0.30^{lmnopqr}	2.75 ^{fgh}	1.77 ^{mnop}	1.27 ^{pqrs}	0.35 ^{no}	1.55 ^{lmno}	1.46 ^{jklmno}	2.25 ^{ijklmn}
	Kishmish black	2.73 ^{fgh}	0.27 ^{nopqrst}	2.76 ^{fgh}	1.89 ^{jklmn}	1.40^{ijklmno}	0.38 ^{mn}	1.50^{mno}	1.32 ^{opqr}	2.45 ^{fghi}
	Hybrid 23-4	2.60^{ghijk}	0.26 ^{opqrstu}	2.38 ^{mnopqrst}	2.07 ^{fghi}	1.31 ^{mnopq}	0.47 ^{hijkl}	1.55 ^{klmno}	1.42 ^{lmnopq}	2.07 ^{no}
	Vita	2.00^{mnopqrst}	0.74 ^{a}	2.46 ^{jklmnopq}	2.15 ^{defg}	1.42 ^{hijklmn}	0.48 ^{hijkl}	1.15 ^{p}	1.36 ^{nopq}	1.70^{qr}
II	Corinth rose	2.68 ^{ghij}	0.32 ^{ijklmno}	3.00^{bcd}	2.27 ^{cd}	1.43 ^{hijklm}	0.49 ^{ghijkl}	1.87 ^{defg}	1.61 ^{ghijk}	2.60^{efg}
	Nymrang x Sultanina	2.99 ^{efg}	0.38 ^{defghi}	2.97 ^{bcde}	2.49 ^{ab}	1.28 ^{opqrs}	0.52 ^{efgh}	1.67 ^{ghijklm}	1.40^{klmnopq}	2.37 ^{hijk}
	Nedelchev VI-4	2.95 ^{efg}	0.43 ^{de}	2.61 ^{fghijkl}	2.26 ^{cde}	1.53 ^{efgh}	0.45 ^{hijklm}	1.50^{mno}	1.50^{ijklmno}	2.62 ^{efg}
	Kishmish moldavski	3.56 ^{cd}	0.19 ^{u}	2.61 ^{fghijkl}	2.09 ^{efgh}	1.62 ^{de}	0.46 ^{hijklm}	1.82 ^{defghi}	1.60^{ghijk}	2.50^{fgh}

Table 2. Continued

III	Kondarev 10	2.93^{efg}	0.42^{de}	2.96^{cde}	2.16^{defg}	1.32^{lmnopq}	0.35^{no}	2.46^{a}	2.15^{a}	2.85^{abcd}
	Rusbol	$2.03^{mnopqrst}$	0.22^{stu}	2.69^{fghi}	1.65^{pqrs}	1.23^{tuvw}	0.50^{bcdefg}	1.90^{def}	$1.39^{klmnopq}$	2.86^{abc}
	Russakla 1	2.22^{klmno}	0.45^{d}	$2.56^{ghijklmn}$	2.09^{efgh}	$1.39^{ijklmnopq}$	0.57^{ab}	1.82^{defghi}	1.80^{cdef}	2.67^{cdef}
	Seedless hybrid V-6	1.68^{stuvwx}	$0.32^{hijklmno}$	2.81^{def}	2.16^{defg}	1.63^{bcd}	0.50^{bcdefg}	2.20^{b}	1.67^{efghi}	2.75^{bcde}
	Beauty seedless	$1.9^{nopqrstuv}$	0.25^{pqrstu}	2.11^{uv}	1.59^{rst}	1.22^{tuvw}	0.37^{lmnopq}	1.15^{p}	1.47^{jklmno}	1.60^{r}
	Corinth seedless	2.68^{hijkl}	$0.28^{mnopqrst}$	2.24^{rstuv}	2.09^{efgh}	1.24^{stuvw}	0.34^{opqr}	1.18^{p}	1.36^{nopq}	1.87^{pq}
	Russalka 3	3.08^{ef}	$0.37^{efghijk}$	2.52^{ijklmn}	2.09^{efgh}	1.27^{qstuv}	$0.46^{efghijk}$	$1.76^{efghijk}$	$1.45^{klmnopq}$	2.24^{ijklmn}
	Flame seedless	3.19^{de}	$0.31^{jklmnop}$	2.69^{fghi}	2.09^{efgh}	1.50^{efghij}	0.31^{pqr}	1.64^{ijklm}	1.88^{bcd}	2.27^{ijklm}
	Corinth white	4.31^{b}	$0.29^{lmnopqr}$	$2.40^{lmnopqrs}$	2.47^{ab}	1.55^{defg}	$0.48^{cdefghij}$	1.43^{no}	1.90^{bc}	1.98^{op}
	Italia x Sultanina	3.31^{cde}	0.41^{def}	2.66^{fghij}	1.72^{nopqr}	1.16^{stu}	0.35^{no}	1.37^{o}	$1.39^{klmnopq}$	2.08^{no}
	Perlette	4.04^{b}	$0.37^{efghijk}$	2.25^{qrstuv}	1.27^{u}	1.25^{qrst}	0.41^{klmn}	1.49^{mno}	1.10^{s}	2.15^{klmno}
	Dilight	4.71^{a}	$0.35^{fghijkl}$	$2.61^{fghijkl}$	1.78^{mnop}	1.46^{ghijk}	0.50^{ghij}	1.89^{def}	$1.45^{klmnopq}$	2.53^{efgh}
	Hybrid 720-19	3.60^{c}	$0.33^{hijklmn}$	3.93^{a}	2.59^{a}	1.32^{lmnopq}	0.41^{klmn}	1.85^{defghi}	1.54^{hijklm}	2.40^{ghij}
	Corinth black	$1.91^{nopqrstuv}$	0.23^{rstu}	2.21^{stuv}	1.90^{jklm}	1.25^{qrst}	0.43^{ijklmn}	1.92^{def}	1.63^{fghij}	2.35^{hijkl}

a,b,c,… – degree of proof at a level of significance $\alpha = 0.05$

the pistil and style (3.07 mm), and Beauty seedless has the smallest – (1.72 mm). There are proven differences among the studied varieties, but among some of them they are minimal, which determines the repeatability of the rank indications by the corresponding indicator.

As a result of the measurements in the middle of the inflorescence, it was found that again Dilight had the longest stem of the flower button (4.71 mm) and Hybrid 21-17-71 – the shortest (1.36 mm), Vita has the widest stem (0.74 mm), and Kishmish moldavski – the narrowest (0.19 mm) (Table 2). The flower button is the longest and widest in Hybrid 720-19 (3.93 mm and 2.59 mm), the shortest in Early kishmish (2.07 mm) and the narrowest – in Perlette (1.27 mm).

The variety White seedless has the largest diameter of the flower bed (1,87 mm) Focha seedless – the smallest (1,05 mm). Focha seedless and Askery have the lowest flower bed (0.22 mm) and Hybrid 21-17-71- the highest (0.59 mm). The smallest length of the pistil was found in Beauty seedless and Vita (1.15 mm), and the largest in Hybrid 21-17-71 (2.52 mm), which has the widest pistil (2.28 mm) and the largest size of pistil and style (3.00). The pistil width is the smallest in Tarnow (1.02 mm). Beauty seedless has the smallest size of pistil and style (1.60 mm), and Early kishmish -the largest (3.00mm).

According to the reported data concerning the top, the longest stem of the flower button belongs to Dilight (4.51 mm), and the shortest – Corinth seedless (1.01 mm), the widest one belongs to Rushaky (0.51 mm), and with the narrowest to Hybrid 23-4 and Corinth seedless (0.21 mm) (Table 3). Hybrid 720-19 has the longest flower button (3.49 mm), and Corinth seedless has the shortest (1.72 mm). The widest proven flower button belongs to Early superior seedless and Hybrid 720-19 (2.54 mm) and the narrowest – to Corinth seedless (1.45 mm). Regarding the diameter of the flower bed Russalka 1 has the highest absolute value (1.74 mm) and the lowest – Corinth seedless (0.99 mm).

Regarding the height of the flower bed, the first is Rushaky (0.69 mm), and the last are Russalka, Focha seedless and Askery (0.25 mm). The pistil is the longest in Superior seedless (2.30 mm), and the shortest in Kara sultani (1.18 mm), the widest in Russalka 1 (2.05 mm) and the narrowest in Tarnow (1.02 mm). Kishmish Irtishor has the largest pistil and style (2.99 mm) and Corinth seedless (1.44 mm)- the smallest (1.44 mm).

According to the multidimensional comparative assessment, there are no proven differences between the experimental data by variants – base, middle, top, except the indicator diameter of the flower bed, which is the longest in the flower buttons at the base of the inflorescence and the shortest – at the top (Table 4).

Table 3. Multidirectional comparative assessment of the seedless varieties of vines based on the studies indicators in the female part of the flower by the Duncan method in the horizontal division of the inflorescence – top, mm

Cluster	Seedless varieties	Flower button stem		Flower button		Flower bed		Pistil		Pistil and style
		length	width	length	width	diameter	height	length	width	length
I	Hybrid 23-4	2.44 def	0.21 s	2.69 efghij	1.82 nopqr	1.36 ghijkl	0.36 hijklmnop	1.45 qrst	1.26 stuv	2.10 lmnopq
	Russalka	2.36 defg	0.31 klmno	2.72 efghi	1.85 mnop	1.27 klmno	0.25 p	1.67 jklmno	1.28 rstuv	2.17 klmnop
	Nymrang x Sultanina	2.32 efgh	0.35 fghijkl	2.73 defg	2.14 fghi	1.27 klmno	0.47 fghij	1.56 mnopqr	1.29 rstu	2.09 mnopqr
	Sultana muscata	1.92 ghijklm	0.32 jklmno	2.73 defg	1.73 pqrs	1.13 pqrs	0.66 de	1.36 tuvw	1.28 rstuv	1.96 opqrst
	Slavyanka	2.02 fghijk	0.38 defghi	2.34 opqrst	1.96 jklmn	1.32 ijklm	0.26 nop	1.8 ghij	1.68 defgh	2.45 efghij
	Hybrid 36-16	2.25 efghi	0.41 bcdefg	2.46 lmnopqr	2.34 bcd	1.55 bcd	0.44 fghijklm	1.69 ijklmn	1.61 efghijk	2.35 ghijklm
	Kondarev	1.91 ghijklm	0.37 efghij	2.42 mnopqrs	2.26 cdef	1.64 abc	0.42 fghijklm	1.62 klmnop	1.50 jklmnop	2.30 hijklm
	Kishmish black	1.93 ghijkl	0.29 lmnopq	2.79 defg	2.04 hijkl	1.45 defgh	0.29 lmnop	1.56 mnopqr	1.41 opqrs	2.44 efghij
	Corinth black	1.60 klmnop	0.24 pqrs	2.17 tuvwx	1.88 mno	1.22 mnop	0.41 fghijklmn	1.73 hijkl	1.53 hijklmno	2.28 ijklmn
	Sultanina gigas	1.31 opq	0.33 jklmno	2.50 klmnop	1.84 nopq	1.06 rs	0.35 ijklmnop	1.27 uvwx	1.13 vwx	1.84 rst
	Kishmish VIRA	1.74 jklmno	0.27 nopqr	2.09 vwx	1.64 stu	1.38 fghijk	0.44 fghijkl	1.62 klmnop	1.63 efghi	2.03 nopqrs
	Korsa kishmish	1.69 jklmno	0.28 nopqr	2.60 ghijklmn	1.90 lmno	1.23 mnop	0.41 fghijklmn	1.72 hijklm	1.22 uvw	2.16 klmnop
	Kishmish Vatkana	1.56 klmnop	0.23 qrs	2.52 jklmno	1.83 nopqr	1.28 klmno	0.39 ghijklmnop	1.6 klmnopq	1.33 qrstu	1.91 pqrst
	Ruby Seedless	1.57 klmnop	0.42 bcdef	2.48 klmnopqr	1.87 mnop	1.36 ghijkl	0.52 fg	1.23 vwx	1.46 klmnopq	2.02 nopqrs
	Focha seedless	1.53 lmnop	0.31 klmno	2.30 rstu	1.61 stu	1.08 qrs	0.25 op	1.38 stuv	1.33 qrstu	2.19 jklmno
	Tarnow	2.01 fghijk	0.27 opqrs	2.41 nopqrs	1.53 uv	1.04 s	0.28 mnop	1.52 opqrs	1.02 x	2.10 lmnopq
	Vita	2.44 def	0.41 bcdef	2.67 efghijk	2.27 cdef	1.40 fghij	0.40 fghijklmnop	1.58 lmnopq	1.57 fghijklmn	2.13 lmnopq
	Kishmish luchistii	1.88 ghijklmn	0.27 nopqr	2.14 uvwx	1.66 stu	1.25 lmno	0.40 fghijklmnop	1.69 ijklmn	1.13 vwx	2.3 hijklm
	Askery	1.80 ijklmn	0.47 ab	2.26 stuv	2.00 ijklm	1.17 opqr	0.25 op	1.83 fghij	1.22 uvw	2.33 ghijklm
	Nedelchev VI-4	2.14 efghij	0.40 cdefgh	2.66 efghijk	2.32 bcd	1.49 def	0.50 fghi	1.5 pqrst	1.5 jklmnop	1.50 uv
	Seedless hybrid V-6	1.71 jklmno	0.39 cdefgh	2.85 cde	2.17 efgh	1.43 defghi	0.41 fghijklmno	1.54 nopqr	1.67 defgh	1.88 qrst
	Kara sultani	2.12 efghij	0.30 klmnop	2.18 tuvw	1.90 lmno	1.39 fghijk	0.45 fghijkl	1.18 x	1.49 jklmnop	1.80 st
	Vanessa seedless	1.44 mnopq	0.40 cdefgh	2.30 qrstu	1.96 jklmn	1.50 def	0.42 fghijklm	1.26 uvwx	1.25 tuvw	1.55 uv
	Early kishmish	1.14 pq	0.22 rs	2.05 wx	1.57 tuv	1.13 pqrs	0.35 ijklmnop	1.93 efg	1.55 ghijklmno	2.44 efghij

Table 3. Continued

II	Red seedless	2.32 efgh	0.28 nopqr	2.70efghij	2.42 ab	1.46 defg	0.41 fghijklmno	2.09 bcd	1.63 efghij	2.80abcd
	Kondarev 10	2.36 defg	0.44 bcd	2.70efghij	2.39 c	1.39 fghijk	0.48 fghij	1.83 fghij	1.80cd	2.62 bcdef
	Kishmish moldavski	2.54 de	0.44 bcd	2.54 ijklmn	2.25 cdef	1.19 nopq	0.31 klmnop	1.87fgh	1.62 efghijk	2.54 defgh
	Kishmish Hyshrau	3.02 c	0.4 cdefgh	2.48 klmnopqr	2.22 defg	1.4 fghij	0.39 ghijklmnop	2.04 cde	1.75 de	2.55 cdefgh
	Early superior seedless	1.73 jklmno	0.41 bcdef	2.78 defg	2.54 a	1.42 efghi	0.46 fghijk	2.15 bc	1.72 def	2.66 bcde
	Rushaky	1.44 mnopq	0.51 a	3.00bc	2.30bcde	1.32 ijklm	0.69 d	1.92 efg	1.71 defg	2.58 cdefg
	White seedless	1.30opq	0.43 bcde	2.76 defg	2.00jklm	1.44 defgh	0.36 hijklmnop	1.91 efg	1.47 jklmnopq	2.48 efghi
	Kolarovets	1.42 nopq	0.38 defghi	2.92 cd	2.00jklm	1.3 ijklmn	0.36 ghijklmnop	1.72 hijklm	1.58 fghijklm	2.30hijklm
	Corinth rose	1.64 klmno	0.31 klmno	2.66 efghijk	2.22 defg	1.53 cde	0.46 fghijk	1.83 fghij	1.68 defgh	2.36 ghijkl
	Nishava	1.42 nopq	0.28 mnopqr	2.63 fghijkl	1.94 klmn	1.22 mnop	0.33 jklmnop	2.03 cde	1.67 defgh	2.76 abcd
	Kishmish Irtishor	1.91 ghijklm	0.47 ab	2.64 fghijkl	2.28 bcdef	1.65 ab	0.51 fgh	2.06 cde	1.97 ab	2.99 a
	Russalka 1	1.91 ghijklm	0.41 bcdef	2.60ghijklmn	2.08 ghijk	1.74 a	0.48 fghij	1.97 def	2.05 a	2.77 abcd
	Corinth seedless	1.84 hijklmno	0.34 hijklm	2.81 def	2.09 ghij	1.55 bcd	0.44 fghijkl	2.30a	1.91 abc	2.81 abc
	Hybrid 21-17-71	2.34 efg	0.35 ghijkl	3.11 b	2.16 efgh	1.65 abc	0.56 ef	2.21 ab	1.96 ab	2.74 bcd
	Trakyska perla	2.03 fghijk	0.45 bc	3.16 b	2.22 defg	1.49 def	0.48 fghij	1.87fgh	1.8 cd	2.34 ghijklm
III	Italia x Sultanina	3.05 c	0.35 ghijkl	2.61 ghijklm	1.67 stu	1.25 lmnop	0.28 mnop	1.51 pqrst	1.43 mnopqr	2.17 klmnop
	Hybrid 720-19	2.78 cd	0.30klmnop	3.49 a	2.54 a	1.36 ghijkl	0.38 ghijklmnop	1.57 lmnopqr	1.43 lmnopqr	2.03 nopqrs
	Russalka 3	1.89 ghijklmn	0.28 mnopqr	2.49 klmnopqr	1.99 jklm	1.27 klmno	0.66 bc	1.62 klmnop	1.42 nopqr	2.13 lmnopq
	Flame seedless	2.24 efghi	0.29 lmnopq	2.49 klmnopq	2.17 efgh	1.38 efghijk	0.26 no	1.44 qrst	1.59 efghijkl	1.92 pqrst
	Beauty seedless	1.88 ghijklmn	0.24 qrs	1.99 x	1.64 stu	1.35 fghijkl	0.50cdefgh	1.23 wx	1.36 pqrstu	1.72 tu
	Rusbol	1.95 ghijkl	0.24 qrs	2.59 hijklmn	1.69 rst	1.28 jklmno	0.41 efghijklmno	1.84 fghi	1.46 klmnopq	2.86 ab
IV	Corinth seedless	1.01 q	0.21 s	1.72 y	1.45 v	0.99 t	0.43 efghijklmn	0.98 y	1.10wx	1.44 v
V	Corinth white	4.09 b	0.43 bcde	2.3 qrstu	2.38 bc	1.47 cdef	0.46 defghijkl	1.41 rstu	1.82 bcd	1.96 opqrst
	Perlette	4.02 b	0.39 cdefgh	2.32 pqrstu	1.70qrst	1.44 cdefg	0.54 bcde	1.8 ghij	1.47 jklmnopq	2.46 efghi
	Dilight	4.51 a	0.36 fghijk	2.76 defg	1.76 opqrs	1.50def	0.46 fghijk	1.98 def	1.40opqrst	2.76 abcd

a,b,c,… – degree of proof at a level of significance α =0.05

Table 4. Multidirectional comparative assessment of the seedless varieties of vines based on the studies indicators in the female part of the flower in the horizontal division of the inflorescence by variants –base, middle, top, mm

Variants	Flower button stem		Flower button		Flower bed		Pistil		Pistil and style
	length	width	length	width	diameter	height	length	width	length
Base	2.337[a]	0.351[a]	2.604[a]	2.054[a]	1.406[a]	0.449[a]	1.706[a]	1.52[2a]	2.327[a]
Middle	2.293[a]	0.338[a]	2.609[a]	2.004[a]	1.371[ab]	0.430[a]	1.732[a]	1.570[a]	2.403[a]
Top	2.068[a]	0.337[a]	2.540[a]	1.980[a]	1.281[b]	0.485[a]	1.688[a]	1.508[a]	2.279[a]

a,b – degree of proof at a level of significance $\alpha = 0.05$

Conclusions

Depending on the degree of biometric similarity of organs in the female part of the flower at the base of the inflorescence, the studied seedless varieties of vines form sixth generalized clusters, three in the middle and five at the top, the majority of them consisting of sub-clusters combined at the corresponding Euclidean distance. The use of the two mathematical and statistical methods – hierarchical cluster analysis and single-factor analysis of variance allows the obtaining of statistically reliable information about the importance of the individual components of the vine flower in the grouping of the seedless varieties.

In the three variants of study – base, middle and top, the individual seedless varieties are not distributed in the same clusters and sub-clusters. The established differences in the parameters of the organs from the female part of the flower confirm the non-simultaneous morphological and cytomeobryological development of the flower buttons depending on the variety, as well as the enormous polymorphism in this group of varieties.

There are no proven differences between the values of the studied indicators for all varieties by variants – base, middle and top. Collecting samples from flower buttons from seedless varieties of vines during the flowering process for cytoembryological, palynological, biotechnological and ampelographic studies can be done independently of their location.

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