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VARIABILITY IN THE ENDEMIC BULGARIAN *GYPSOPHILA TEKIRE* STEF. POPULATION

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ABSTRACT. Bulgarian *Gypsuphila tekiare Steff.* population has been studied Our observations revealed two distinct forms, that differ the number of vegetative branches, that changes their habitus. The morphological traits of the leaves on the main stem differ between the two forms as well. These differences were confirmed by the results from the ANOVA analyses. Further confirmation were obtained by the anatomical studies From the regression analyses of both morphological and anatomical differences function, confirming distinctiveness of the two groups, were obtained. Based on both ANOVA and regression analyses results too new *Gypsophila tekirae Stef* forms should be recognized.

KEYWORDS. Bulgaria, medical plants, plant classification, systematics

INTRODUCTION

The classical morphological .caryological, and anatomic methods of investigation have failed to resolve the systematic classification and taxonomic range differences among *Gypsophila* spp., especially *Gypsophila trichotoma* and the endemic Bulgarian species. *Gypsophila tekirae.* According to Huber-Morath (1) *Gypsophila trichotoma, Gypsophila tekirae, Gypsophila anatolica Gypsophila pauli* are synonyms of *Gypsophila perfotiata* and no justification for maintainig separate taxa exists.

In Bulgaria, the perennial *Gypsophila* species classified as *Gypsophila trihotoma Wend, Gypsophila paniculata* L., *Gypsophila lekirae Stef. and Gypsophila glomerata* Pall, and the annual *(Gypsophila muralis L.)* are quite common along the Black Sea Coast and adjoining highlands.. The present populations of *Gypsophila* plants in Bulgaria, represent an opportunity to *ex*amine plant characteristics that could be used in systematic classification of the species.

MATERIAL AND METHODS

The materials collected from the natural population of the Bulgarian endemic *Gypsophila tekirae Stef., Caryophillaceae Juss.,* on the territory of Hadjievo village, Plovdiv region, were investigated by the classical morphological analysis and some methods of comparative anatomic study /2,3,4,5/ were used. ANOVA analyses were used to confirm differences between morphological trials of leaves. Further confirmation were obtained by the anatomical studies from the regression analyses of both morphological and anatomical differences.

RESULTS

The statistic analysis of the morphological traits of the leaves on the main stem determines the leaf shape of R_1 variety as broad oval to broad elliptic and of R_2 as oval to elliptic; the leaves on the sterile shoots being narrow oval for both varieties.

The differences in the habitus and the morphological and anatomic differences of the leaves give a reason to determine variety /var. latifolia/within the species.

Gipsophila tekirae Stef. var. **latifolia** Kozh. var. n.

Folia latoovalia vel latoelipsoidea. Ramus sterilis in basi caulis 2-3. Typus: Tracian plain in loco Besaparski ridove prope stationem Hadzievo in flore 01.08.1990 in herbario Instituti Agronomici Plovdiv conservator **№ 45580.**

The existence of two varieties /R, - number of the sterile shoots on the main stem - 2-3 and R_2 - 7-9, respectively/, markedly distinguished by their habitus /Fig. 1 and Fig. 2/, made it necessary to study the morphological and anatomic characteristics of the leaves on the main stem and the sterile shoots /L -length in mm; W - width in mm; L/W index; L_w - length up to the largest width; percentage L_w; N_{BEC} / mm ^{2} number of the basic epidermal cells; N_{STOM}/ mm^2 number of stomas; L_{STOM} mkm sloma length; W_{STOM} mkm stoma width; S_{STOM} mkm^2 - stoma surface/.

The differences in the morphological indices of the leaves on the main stem and the sterile shoots are presented in Table 1.

The correlation-regression analysis of the leaves on the main stem shows that the L_w depends more on L and W in R_2 /Fig. 3, 4/ while index L/W of both varieties depends only on W. As for the leaves on the sterile shoots L/W depends on L and W, but only in R_2 L_w is related to L and W.

The differences in the anatomic indices for the upper and the lower epidermis of leaves on the main stem and on the sterile shoots are shown in Tables 2, 3.

Fig. 5, 6 present the existence and the absence of a correlation between the various anatomic indices in both varieties.

CONCLUSION

Based on both ANOVA and regression analyses results too new *Gypsophila tekirae Stef.* forms should be recognized.

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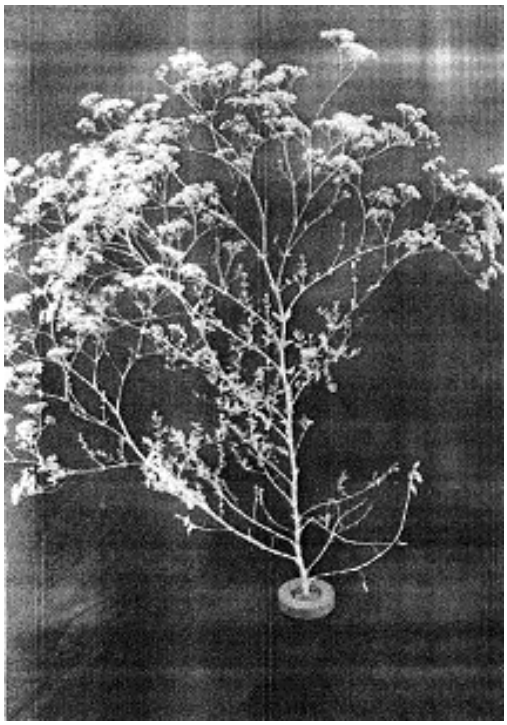


Fig. 1. *Gipsophila tekirae Stef. var. latifolia Kozh.*

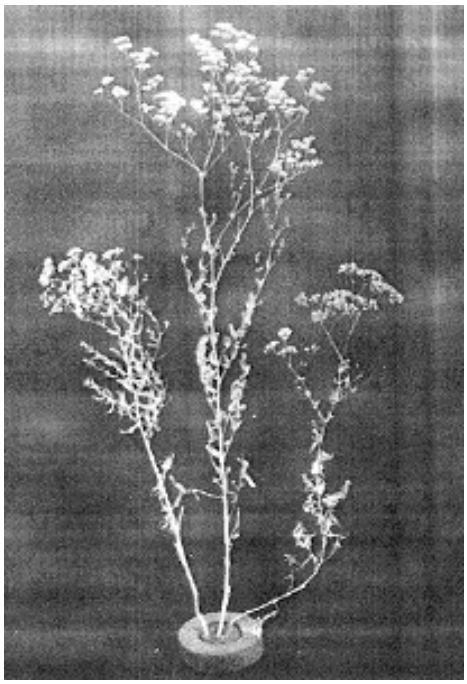


Fig. 2. *Gipsophila tekirae Stef.*

Morphological characteristics of the leaves

Table.1

		R_1				R_2				
N	indices	X±Sx	min	max.	V%	X±Sx	min	max.	V%	t
leaves on the main stem										
1	L	59.44 0.55	48.0	68.0	8.74	48.41 0.63	35.0	59.0	12.39	13.4
2	W	19.1 0.32	10.0	27.5	16.2	11.63 0.24	8.0	18.0	19.41	19.6
3	Lw	16.59 0.62	7.0	30.0	35.46	9.0 0.52	4.0	14.0	28.15	11.4
4	L/V	3.18 0.05	2.22	5.0	15.09	4.23 0.06	3.16	5.5	12.29	14.7
5	%L_W	27.73 0.93	12.07	45.45	31.73	18.45 0.43	10.53	25.0	22.27	9.0
leaves on the sterile shoots										
6	L	28.4 0.54	18.0	39.5	17.95	31.7 0.64	18.1	44.0	19.24	3.8
7	W	7.27 0.15	4.0	10.0	19.55	6.6 0.15	4.0	10.0	21.51	3.3
8	L_w	10.83 0.26	4.0	18.0	23.06	10.48 0.39	4.0	20.0	35.68	0.8
9	L/V	4.02 0.09	2.0	6.25	21.64	4.89 0.1	3.16	9.0	20.24	6.1
10	%L_W	39.37 1.23	11.43	78.26	29.61	33.37 1.04	13.89	60.0	29.57	4.0

Characteristics of the upper epidermis

Table.2

		R_1				R_2				
N	indices	X±Sx	min	max.	V%	X±Sx	min	max.	V%	t
leaves on the main stem										
1	N_{BEC}	222.2 4.6	173.6	277.8	10.9	311.9 4.74	260.4	364.6	8.33	12.6
2	N_{STOM}	64.24 3.6	34.7	104.2	30.2	93.75 3.69	52.1	138.9	21.5	6.0
3	L_{STOM}	33.9 0.4	29.5	39.0	7.05	34.74 0.56	31.5	48.0	8.8	1.2
4	W_{STOM}	26.94 0.3	23.75	30.5	5.93	24.04 0.26	21.25	27.0	5.94	7.3
5	S_{STOM}	716.2 10	596.3	809.5	7.93	662.37 16.03	554.7	989.1	13.2	2.7
leaves on the sterile shoots										
6	N_{BEC}	269.7 4.6	208.3	312.5	9.3	257.5 3.54	225.7	295.1	7.5	2.1
7	N_{STOM}	79.86 3.8	52.1	121.5	25.9	68.9 3.67	34.7	104.2	29.2	2.3
8	L_{STOM}	34.82 0.5	28.3	39.5	8.47	36.25 0.37	32.25	40.8	5.6	2.4
9	W_{STOM}	24.7 0.2	23.0	28.75	2.99	23.48 0.22	21.25	26.25	5.0	3.8
10	S_{STOM}	673.9 9.2	552.9	790.7	7.5	667.6 8.15	604.5	780.1	6.68	0.6

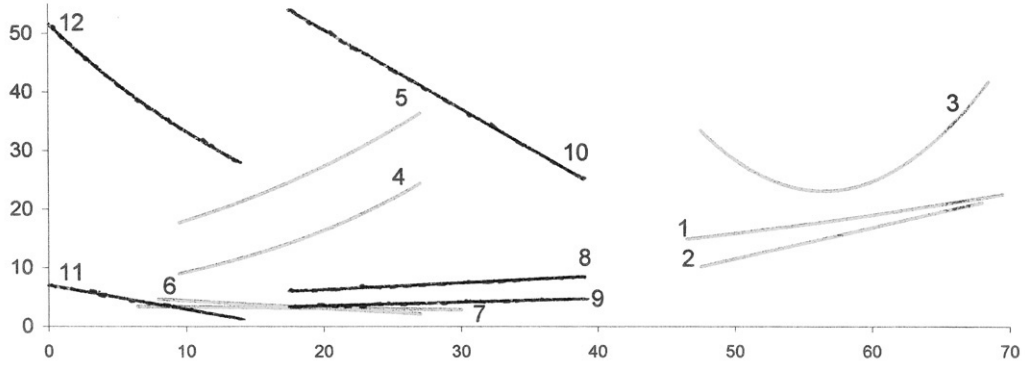
Characteristics of the lower epidermis

Table.3

		R_1				R_2				
N	indices	X±Sx	min	max	V%	X±Sx	min	max.	V%	
leaves on the main stem										
1	N_{BEC}	241.3 4.4	190.9	295.1	10.0	287.62 4.3	260.4	329.9	8.18	7.2
2	N_{STOM}	72.92 3.4	34.72	104.2	25.3	74.07 3.99	34.72	121.5	29.4	0.2
3	L_{STOM}	38.02 0.4	33.75	42.0	5.57	35.2 0.4	31.25	40.75	6.19	5.5
4	W_{STOM}	25.69 0.2	23.0	28.25	4.9	23.25 0.24	20.25	26.25	5.67	7.6
5	S_{STOM}	766.1 8.4	677.1	848.2	6.01	642.33 9.39	508.68	710.9	8.0	9.3
leaves on the sterile shoots										
6	N_{BEC}	307.1 5.2	260.4	364.6	9.28	302.66 6.1	243.1	364.5	11.0	0.6
7	N_{STOM}	82.2 3.4	52.1	121.5	22.8	54.4 2.73	17.36	86.8	27.4	7.0
8	L_{STOM}	34.7 0.3	31.0	38.25	4.73	33.92 0.36	29.5	37.5	5.83	1.5
9	W_{STOM}	24.4 0.1	23.0	26.25	2.99	22.53 0.21	19.5	24.25	5.01	7.4
10	S_{STOM}	664.0 7.0	584.0	777.9	5.79	599.66 7.78	497.88	699.6	7.11	5.8

Equations from the correlation-regression analysis of the morphological indices of the R_1 leaves

Fig.3

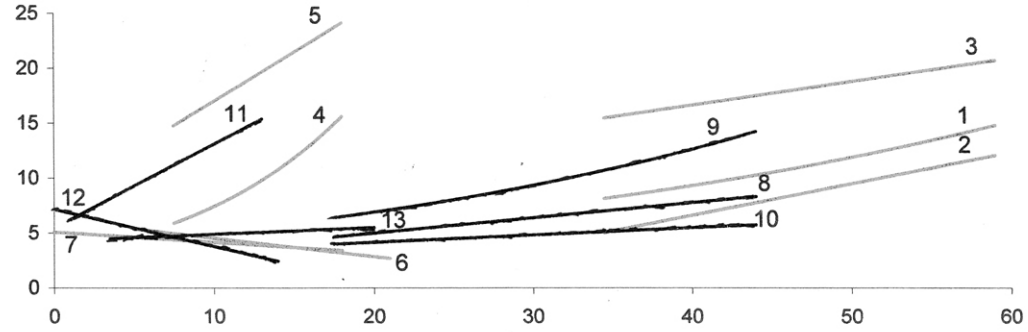


leaves on the main stem :1) L-W, r =0.54, $Y=100e^{-5.7x}$;2)L-L_W, r = 0.47,Y=0.54x-15.2; 3)L-%L_W, r=0.23, $Y=0.12x^2-14.6x+435.5$; 4) W-L_W, r=0.49, $Y=100e^{-4.5x}$;
5)W - % L_W,r = 0.4,$Y=100e^{-3.6x^{\wedge}0.79}$;6) W-L/W, r = - 0.83,Y= -0.13x+5.69 ;7) L_W- L/W, r= -0.3, Y= -0.024x+3.58.

leaves on the sterile shoots : 8) L-W, r=0.42, Y=0.12x+3.94 ; 9) L-L/W, r = 0.37, Y=0.06x+2.25; 10) L-%L_W, r= -0.59,Y= -1.34x+77.6 ; 11) W-L/W, r = - 0.67,Y= -0.41x+7; 12) W-%L_W, r= - 0.195, $Y=4.65e^{-0.34x}$.

Equations from the correlation-regression analysis of the morphological indices of the R_2 leaves

Fig.4

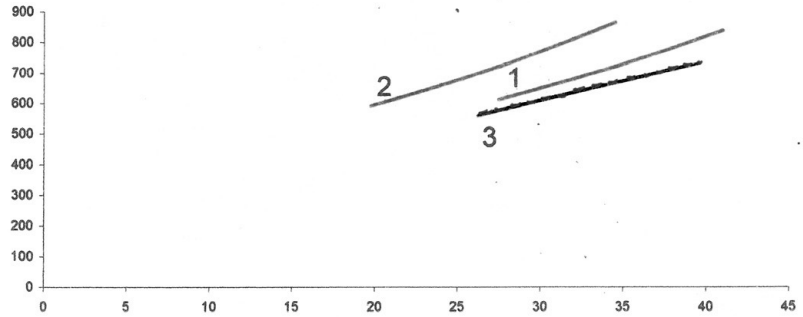


leaves on the main stem :1)L-W, r =0.78, $Y=100e^{-7x^{\wedge}1.25}$;2)L-$L_W$, r = 0.67,Y=0.29x-4.87; 3)L-%L_W, r=0.31, Y=0.22x+8 ; 4) W-L_W, r=0.72, $Y=100e^{-4.9x}$;
5)W - % L_W,r = 0.48,Y=0.89x+8.13 ;6) W-L/W, r = - 0.73,Y= -0.17x+6.2 ;7) L_W- L/W, r= -0.45, Y= -0.09x+5.07.

leaves on the sterile shoots : 8) L-W, r=0.59, Y=0.14x+2.2 ; 9) L- L_W, r = 0.52, $Y=100e^{-5.7x}$, 10) L- L/W, r= -0.38,Y= 0.07x+2.82 ; 11) W- L_W, r = 0.29,Y= 0.76x+5.44; 12) W- L/W, r= - 0.47, Y= - 0.34x+7.14; 13) L_W-L/W, r = 0.24,Y= 0.06x+4.25.

Equation from the correlation-regression analysis of the indices of the upper epidermis

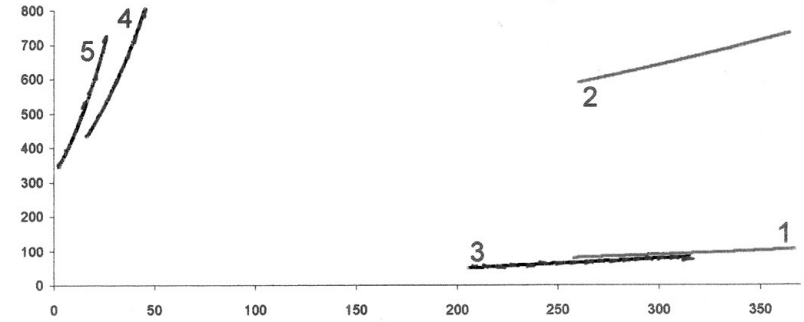
Fig.5



R_1

—— leaves on the main stem: 1)L_{STOM} - S_{STOM}, r = 0.7, $Y=e^{3.77x^{0.79}}$;)W_{STOM} - S_{STOM}, r = 0.5, $Y=e^{4.43x^{0.67}}$

—— leaves on the sterile shoots:3)L_{STOM} - S_{STOM}, r = 0.76, Y=12.95x+223.1



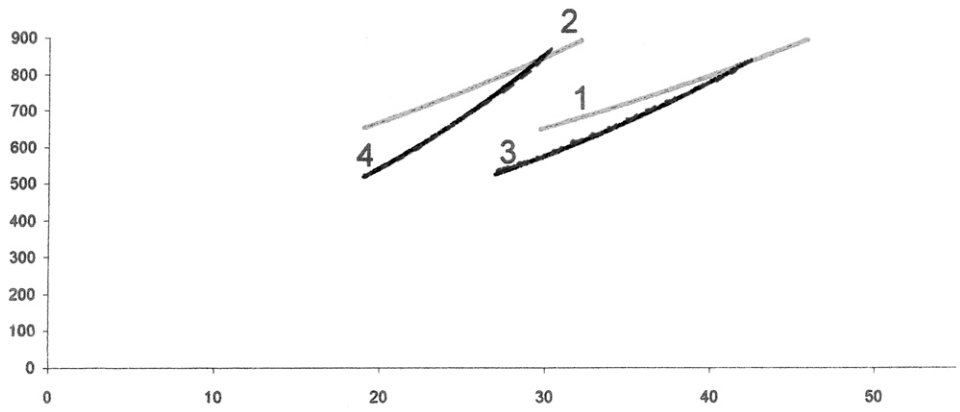
R_2

—— leaves on the main stem : 1)N_{BEC} - N_{STOM}, r = 0.33, $Y=33.78e^{x}$; 2)N_{STOM} - S_{STOM}, r = 0.42, $Y=100e^{-1.9x^{0.66}}$

——leaves on the sterile shoots :3) N_{BEC} - N_{STOM}, r = 0.34, $Y=0.05x^{1.31;}$ 4)L_{STOM} - S_{STOM}, r = 0.66, $Y=e^{3.64x^{0.79}}$; 5)W_{STOM} - S_{STOM}, r = 0.56, $Y=e^{4.14x^{0.74}}$

Equations from the correlation-regression analysis of the indices of the lower epidermis

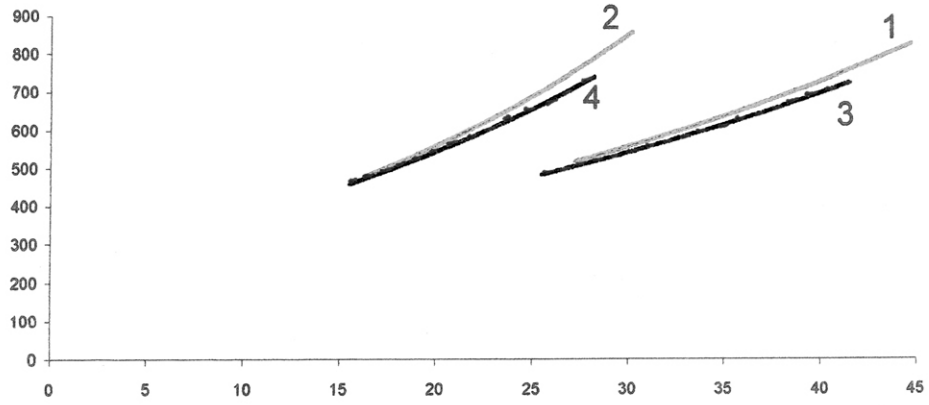
Fig.6



R_1

leaves on the main stem: 1)L_{STOM} - S_{STOM}, r = 0.69, $Y=e^{3.69x^{0.73}}$; 2)W_{STOM} - S_{STOM}, r = 0.47, $Y=e^{4.56x^{0.61}}$

leaves on the sterile shoots:3)L_{STOM} - S_{STOM}, r = 0.84, $Y=e^{2.8x^{1.03}}$; 4)W_{STOM} - S_{STOM}, r = 0.58, $Y=e^{2.82x^{1.14}}$



R_2

leaves on the main stem: 1)L_{STOM} - S_{STOM}, r = 0.7, $Y=e^{3.28x^{0.89}}$; 2)W_{STOM} - S_{STOM}, r = 0.67, $Y=e^{3.48x^{0.94}}$

leaves on the sterile shoots :3)L_{STOM} - S_{STOM}, r = 0.69, $Y=e^{3.43x^{0.8}}$; 4)W_{STOM} - S_{STOM}, r = 0.59, $Y=e^{3.57x^{0.84}}$