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THE FIELD AND LABORATORY STUDY OF THE COLLECTION SAMPLES OF ONION BREED *ALLIUM CEPA* L.

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ABSTRACT

Thirteen collection samples of *Allium cepa* L. of different ecology-geographical origin grown in the Crimea conditions are given. Morphometric characteristics of the bulbs – the form index, the diameter, the height, the weight, the thickness and the quantity of rich skins are analyzed. The greatest output of standart production (90 – 95.6%) was observed for all breeds. The biochemical values of the *Allium* cepa L. samples under study were examined by the traditional methods. It is marked that the dry substances, the sugars sum, the mono- and disaccharides in the majority of the samples exceed the standart (Yaltinsky rubin) on 14 – 39%, 11 – 48% and 36 – 150% correspondently. The samples with the high concentration of essential oil are singled out: Yaltinsky rubin (Crimea), Tavrichesky (Crimea), Blood red flat (Netherlands) and Brown Beauty (USA) – 4.5, 6.2, 5.6 and 4.4% correspondently. The microsculpture of *Allium cepa* L. leaf was studied by the method of raster electron mi-croscopy and the essential breed differences of the stomata quantity and their arrangement towards the leaf level were distinguished. The results of electron-microscopic research indicate the different level of *Allium cepa* L. samples adaptability. *Allium cepa* L. samples under study of the southern subspecies are recommended for the development of the new breeds with the advanced nutritional qualities.

Keywords: sample; *Allium cepa* L.; bulb onion; morphological and biometric characteristics; essential oils; the parameters of the stomata of the leaves

INTRODUCTION

The peculiarities of the bulb onion breed *Allium cepa* L. growth in Russia are the increase of the cultivated areas in the Southern regions, the yield and the gross collection rise (**Litvinov et al., 2015**). The bulb onion consumption increases not only for the fresh usage, but also for the industrial processing (**Pivovarov, et al., 2001**). For 2006 – 2009 the world gross collection of the bulb onion grew almost on 12% from 66 mln. t to 74 mln. t **(BUSINESSTAT, 2011).** On the world market of *Allium cepa* L. production China is on the first place – 30% of onion in the total production structure; 19% are produced in India; 4.9% in the USA and 2.2% in the Russian Federation. The main production of *Allium cepa* L. in the Russian Federation is placed in three districts: Privolzhsky, Southern and Central. The new breeds and hybrids of *Allium cepa* L. should possess early ripening, yield, stability to diseases and blasts, good storability, small variability of morphological characteristics, the concentration of dry substances in the bulbs 7 – 10% for the salad breeds and 12 – 18% for pungent ones (**Nemtinov et al., 2006**).

The adaptability of the ontogenesis stages, cytological peculiarities of the leaf's epidermis surface, the stomata quantity on 1 mm^2 of intercellular structure of the leaf surface allow to judge about the economical valuable characteristics of the breed **(Yudaeva et al., 2017).** The adaptability of the plants to new conditions depends on the genetic variability in the selection process (**Grinberg et al., 2007; Kalbarczyk, 2008; Bystrická et al., 2014**).

Allium cepa L. is a useful vegetable plant and the source of some biologically active substances. The vitamins and phenol compositions, especially quercetin, possess antioxidant and antibacterial activity **(Ulyanova, 1998; Platonova, 2000; Parr et al., 2000; Romanova et al., 2008; Kavalcová et al., 2015; Silva, et al., 2007; Tawaha, et al., 2007**). The aminoacids – arginine, lysine, leucine, isoleucine, threonine, phenylalanine, alanine, glycine, histidine, serine as well as glutamic and asparlic acids are found in the bulbs. The prolonged consumption of food rich in plant polyphenols guarantees the organism protection from cancer, heart diseases, diabetes, osteoporosis and neurodegenerative diseases (**Pandey et al., 2009**). *Allium cepa* L. antioxidant activity of the bulbs

of different colour is not the same. **Prakash et al. (2007)** and **Cheng et al. (2013)**, experimentally determined the value of the antioxidant activity: 50.6% in the red bulb onion and 13.6% in the white one. **Nuutila et al. (2003)** discovered that the antioxidant activity of yellow and red-coloured breeds is in the range from 32.9% till 44.5%.

Scientific hypothesis

Comparative morphological and biochemical assessment of *Allium cepa* L. varieties of different ecological and geographical origin has not been studied sufficiently. We tested the influence of the *Allium cepa* L. genotype on the economically valuable and morphological features when grown in conditions of Crimea.

MATERIAL AND METHODOLOGY

Objects of research

Investigated of the samples of the bulb onion from 9 countries of Federal Reach Center "All-Russian Institute of Plants Genetic Resources named after N. I. Vavilov" collection was used. The samples differed by origin: 4 samples from Russia (the Crimea: Yaltinsky rubin, Yaltinsky model №3, Tavrichesky and Krasnodarsky Kray: Mestniy); 2 ones from the USA (Southport red, Brown Beauty); as well as from Australia (B12132B0, Azerbaijan (Mestniy), Algeria (Rouge pale), Bulgaria (Trimontzium), Bolivia (Red Wethers field), Netherlands (Blood red flat) and Portugal (Valensiya). Breed Yaltinsky rubin was accepted as the standart.

The researches place and methods

The field researches were held in 2016 – 2017. The onion plants were grown in the collection nursery of Federal State Budget Scientific Institute "Scientific-Research Institute of Agriculture of the Crimea" (FSBSI SRIA of the Crimea). The grounds are presented by the southern calcareous black soil. The agrochemical characteristics of 20 sm ground layer: the humus concentration by Tyurin – 4.5 – 5.4%; pH reaction – 7.85; mineral nitrogen N – NO_3 – 6.3 mg.100g^{-1} of the soil; labile phosphorus concentration P_2O_5 (by Machigin) – 18.4 mg.100g^{-1} of the soil; exchangeable potassium concentration K_2O (by Machigin) – 73.0 mg.100g^{-1} of the soil. The plants were grown in 4 replications on the registration plots with the squares from 0.5 m^2 till 1 m^2.

Environmental assessment of output

The ecological evaluation of the output yield was fulfilled, the photometric peculi-arities of the leaves and bulbs were described – the form index, diameter, height, weight, thickness of rich skins, quantity (rich skins rudiments) **(Vavilova, 2005)**.

Chemicals

All chemical substances chosen forthe analysis were of analytical sortand were bought from Sigma Aldrich (USA) and Merck KgaA (Germany).

Sample preparation

300 g of the average sample was homogenized with the help of high-speed homogenizer (10 000 rpm, 1 min, UltraTurrax T25 Basic, IKA). The extractionaswell as the measurements were held in three-time repetition.

Basic chemical analyses

The following biochemical characteristics of the bulbs quality were determined: dry substance – using the thermographic method **(GOST 2173-2013, 2014)**, ascorbic acid – using the titrimetric method by Murri **(R 4.1.1672-03, 2003)**, the sugars and the reductive sugars sum in accordance with **GOST 8756.13-87 (2010)**, the essential oil concentration – using the distillation chromatographic method **(Timasheva et al., 2018)**.

Electron microscopic examination

The morphologic characteristics of *Allium cepa* L. samples leaves were studied in the Laboratory of Physiology and Biochemistry of Federal State Budgetary Scientific Institution "All-Russian Horticultural Institute for Breeding, Agrotechnology and Nursery" by the method of raster electronic microscopy (REM). For the researches the leaves cuttings from the central part of the rosette (in the second decade of June) with the dimensions 5 × 5 mm were placed on a special gluing tape set on the object table of REM JEOL JSM 6010-LA. The epidermis was studied from the leaf abaxial side in accordance with REM operating rules.

Statisic analysis

Results were statistically evaluated by the Analysis of Variance. All the assays were carried out in triplicates and results are expressed as mean ±SD. All calculations were made with the help of Microsoft Office 2013 software package (Microsoft, USA).

RESULTS AND DISCUSSION

Allium cepa L. prolonged vegetation period in the southern regions of Russia and the duration of the bulbs storage period determined the traditionally vested rules: the bulbs onions should be mid-ripening, half-pungent and sweet (salad). The bulb form was an important grading factor and influenced on the consumer's demand for the salad onion of the southern subspecies. The form index 0.5 – 0.7 corresponded to six samples – two from the Crimea (Yaltinsky rubin – standart and Yaltinsky model №3), Mestniy (Krasnodar, Russia), Rouge pale (Algeria), Mestniy (Azerbaijan), Red Wethers field (Bolivia). The rest samples had the index 0.8 – 0.9. The sample B12132B (Australia) had index 1.1. The greatest bulbs diameter (7.4 – 9.0) is characteristic of the samples Mestniy (Azerbaijan), Valensiya (Portugal), Brown Beauty (USA), Yaltinsky rubin (Crimea) – standart and Yaltinsky model №3 (Crimea). The maximal bulbs height is 7.8 sm is typical for the sample B12132B (Australia). Seven samples annually exceeded the standart by the bulbs height. Sample 5 (Tav-richesky) had the bulb diameter of small size 3 – 5 sm, middle size was at 9 samples (1, 2, 3, 4, 6, 7, 8, 10 and 11) and large 8 – 9 sm – at standart and sample 12. Within 2 years the value of the bulbs diameter was less than the standart except the sample Yaltinsky. During the evaluation of the bulbs morphological factors are the thickness, the rich skins and rudiments quantity. The greatest thick-ness of the bulb rich skins (from 5.2 till

7.6 mm) is marked for the samples Brown Beauty (USA), Rouge pale (Algeria), Yaltinsky rubin (Crimea) – standart and Yaltinsky model №3 (Crimea) (Table 1).

The rudiments quantity in the bulb influences the bulb onion reproduction coefficient. The samples Mestniy (Krasnodar, Russia), B12132B (Australia), Tavrichesky (Crimea), Blood red flat (Netherlands), Brown Beauty (USA) and Yaltinsky model №3 (Crimea) showed the rudimentariness less than 2pcs., the rest ones corresponded to the standart level (2 – 2.5 pcs.).The bulbs weight relates to the economical characteristics of the breed. The biggest bulbs weight is marked at the samples Brown Beauty (USA), Southport red (USA), Yaltinsky rubin (Crimea) – standart and Yaltinsky model №3 (Crimea) – 152, 166, 170 and 211 g correspondently. The samples yield at average for 2 years varied in the range 2.2 – 4.5 kg.m^{-2}, the highest one is at the standart 45 kg.m^{-2}. The sample Mestniy (Azerbaijan) was less than the standart on 2.0%. The largest output of the standart products 93.2 – 95.6% was marked at the samples Mestniy (Azerbaijan), Yaltinsky model №3 (Crimea), Brown Beauty (USA), Valensiya (Portugal) and Valensiya (Portugal) (Table 2). It is known the the bulbs colour indicates the presence of the antioxidants – polyphenols: flavonoids (quercetin, rutin) and anthocyans in the products **(Nuutila et al., 2003; Kong et al., 2003; Lu et al., 2011; Cheng et al., 2013)**. As a result it can be supposed that yellow, white and light-pink bulbs contain flavoids (quercetin and rutin), and brown-purple, dark-purple and purple bulbs Yaltinsky rubin (Crimea) – standart, Yaltinsky model №3 (Crimea) and Trimontzium (Bulgaria) – anthocyans. Such breeds are very popular on the onion market (Figure 1).

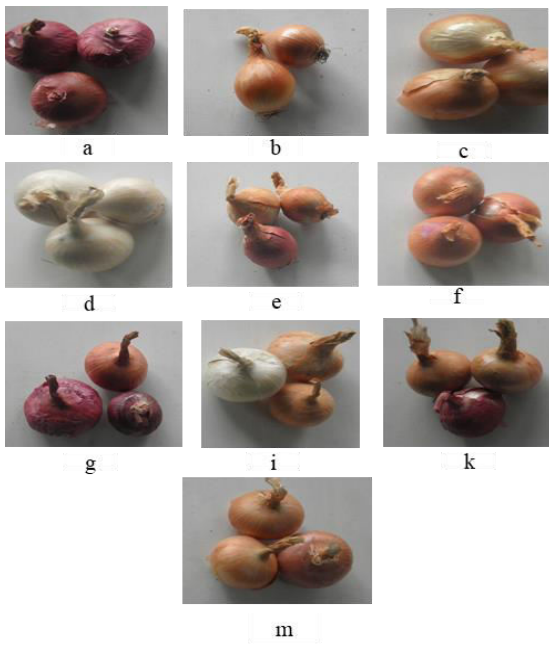

Figure 1 *Allium cepa* L. samples of different bulb colour a: Yaltinsky rubin (Crimea) – purple, b: Mestniy (Krasnodar, Russia) – yellow, c: Southport red (USA) – yellow, d: Trimontzium (Bulgaria) – white, e: Tavrichesky (Crimea) – light pink, f: Rouge pale (Algeria) – yellow, g: Red Wethers field (Bolivia) – dark-purple, i: Blood red flat (Netherlands) – yellow, k: Valensiya -(Portugal) – yellow, m: Brown Beauty (USA) – yellow.

Table 1 *Allium cepa* L. morphometric factors (2016 – 2017).

The sample No., name and origin	The form index	Diameter, (sm ±SD)	Height, (sm ±SD)	Weight (g ±SD)	Thickness of rich skins (mm ±SD)	Quantity (pcs ±SD)	
						rich skins	rudiments
Yaltinsky rubin (Crimea) – standart	0.5	8.20 ±0.20	4.1 ±0.09	169.5 ±8.9	6.4 ±0.5	5.4 ±0.29	2.5 ±0.38
1. Mestniy (Krasnodar, Russia)	0.7	5.8 ±0.59	4.1 ±0.35	124.1 ±13.9	4.5 ±0.65	6.8 ±0.25	1.25 ±0.25
2. B12132B (Australia)	1.1	6.3 ±0.42	7.8 ±0.46	127.6 ±8.2	3.8 ±0.39	6.8 ±0.2	1.33 ±0.17
3. Southport red (USA)	0.9	6.8 ±0.40	6.4 ±0.33	165.5 ±12.0	3.7 ±0.33	7.3 ±0.4	2.44 ±0.34
4. Trimontzium (Bulgaria)	0.9	6.6 ±0.26	6.1 ±0.29	101.7 ±6.8	4.4 ±0.34	6.5 ±0.38	2.1 ±0.26
5. Tavrichesky (Crimea)	0,9	5.2 ±0.15	4.8 ±0.24	99.6 ±8.2	4.2 ±0.36	5.4 ±0.5	1.67 ±0.23
6. Rouge pale (Algeria)	0.7	6.3 ±0.26	4.6 ±0.10	120.6 ±7.6	5.5 ±0.24	5.2 ±0.22	2.33 ±0.17
7. Mestniy (Azerbaijan)	0.7	7.4 ±0.21	5.5 ±0.24	143.8 ±8.6	4.7 ±0.37	5.9 ±0.51	2.11 ±0.20
8 Red Wethers field (Bolivia)	0.7	6.2 ±0.25	4.3 ±0.11	97.8 ±4.3	4.8 ±0.45	5.9 ±0.39	2.11 ±0.26
9. Blood red flat (Netherlands)	0.9	6.8 ±0.34	6.0 ±0.23	127.1 ±11.9	4.1 ±0.39	7.4 ±0.29	1.33 ±0.17
10. Valensiya (Portugal)	0.8	7.6 ±0.25	6.4 ±0.36	134.5 ±14.1	4.8 ±0.28	6.6 ±0.56	2.22 ±0.32
11. Brown Beauty (USA)	0.8	7.8 ±0.23	6.1 ±0.25	151.9 ±6.86	5 ±0.41	7.6 ±0.24	1.56 ±0.34
12. Yaltinsky model №3 (Crimea)	0.5	9.0 ±0.36	4.4 ±0.19	211.0 ±6.46	7.6 ±0.93	6.8 ±0.73	1.5 ±0.29
$HD_{0,05}$	-	1.1	1.0	30.5	1.6	1.6	1.1

Table 2 *Allium cepa L.* yield, growing in the collection nursery (2016 – 2017).

The sample No., name and origin	Yield ($kg.m^{-2}$ ±SD)				The standart products output, %
	2016	2017	average	± to standart, %	
Yaltinsky rubin (Crimea) –standart	4.10 ±0.07	4.87 ±0.31	4.5	-	90.6
1. Mestniy (Krasnodar, Russia)	2.72 ±0.10	3.30 ±0.10	3.0	-33	91.9
2. B12132B (Australia)	0.70 ±0.03	3,77 ±0.07	2.2	-51	90.0
3. Valensiya (Portugal)	2.75 ±0.06	3.50 ±0.09	3.2	-29	95.6
4. Trimontzium (Bulgaria)	2.37 ±0.06	3.35 ±0.25	2.9	-36	90.8
5. Tavrichesky (Crimea)	2.90 ±0.07	2.85 ±0.55	2.8	-38	84.9
6. Rouge pale (Algeria)	1.87 ±0.05	3.12 ±0.14	2.5	-44	84.6
7. Mestniy (Azerbaijan)	3.45 ±0.06	5.22 ±0.29	4.4	-2	93.2
8 Red Wethers field (Bolivia))	1.97 ±0.09	2.40 ±0.12	2.2	-51	78.4
9. Blood red flat (Netherlands)	1.85 ±0.05	3.60 ±0.11	2.8	-38	89.6
10. Valensiya (Portugal)	3.45 ±0.12	3.67 ±0.22	3.6	-20	95.4
11. Brown Beauty (USA)	2.82 ±0.11	3.72 ±0.24	3.2	-29	95.2
12. Yaltinsky model №3 (Crimea)	-	3.70 ±0.21	3.7	-24	94.1
$HD_{0,05}$	0.23	0.33			

Table 3 *Allium cepa* L. biochemical content, growing in the selection nursery (2016 – 2017).

The sample No., name and origin	Dry substance (% ±SD)	General sugars (% ±SD)			Ascorbic acid ($mg.100g^{-1}$ ±SD)	Essential oil (% ±SD)
		total	including			
			monosaccharides	Disaccharides		
Yaltinsky rubin (Crimea) – standart	8.8 ±0.3	11.7 ±0.5	6.7 ±0.3	5.0 ±0.3	18.6 ±0.6	4.5 ±0.4
1. Mestniy (Krasnodar, Russia)	10.5 ±0.3	13.0 ±0.6	2.6 ±0.1	10.4 ±0.5	11.8 ±0.4	2.8 ±0.3
2. B12132B (Australia)	7.7 ±0.2	11.4 ±0.4	5.4 ±0.3	6.0 ±0.4	16.6 ±0.5	2.8 ±0.3
3. Southport red (USA)	10.0 ±0.3	14.4 ±0.5	4.4 ±0.3	10.0 ±0.5	12.9 ±0.4	2.8 ±0.3
4. Trimontzium (Bulgaria)	11.4 ±0.4	14.7 ±0.5	4.3 ±0.3	10.4 ±0.5	16.1 ±0.5	1.6 ±0.2
5. Tavrichesky (Crimea)	11.5 ±0.4	13.2 ±0.4	3.4 ±0.2	9.8 ±0.5	16.2 ±0.5	6.2 ±0.5
6. Rouge pale (Algeria)	12.2 ±0.4	13.7 ±0.5	3.4 ±0.2	10.3 ±0.4	16.3 ±0.5	4.1 ±0.4
7. Mestniy (Azerbaijan)	10.8 ±0.3	13.6 ±0.4	3.8 ±0.2	9.8 ±0.4	18.6 ±0.6	2.7 ±0.3
8 Red Wethers field (Bolivia)	10.8 ±0.3	17.3 ±0.6	6.1 ±0.3	11.2 ±0.5	21.1 ±0.6	4.0 ±0.4
9. Blood red flat (Netherlands)	10.6 ±0.3	12.5 ±0.3	5.7 ±0.3	6.8 ±0.3	19.6 ±0.5	5.6 ±0.5
10. Valensiya (Portugal)	11.4 ±0.4	16.7 ±0.5	5.2 ±0.3	11.5 ±0.5	16.7 ±0.4	4.0 ±0.4
11. Brown Beauty (USA)	11.7 ±0.4	18.1 ±0.6	5.8 ±0.3	12.5 ±0.6	14.8 ±0.3	4.4 ±0.4
12. Yaltinsky model №3 (Crimea)	7.1 ±0.2	11.3 ±0.3	7.4 ±0.3	3.9 ±0.1	27.3 ±0.6	0.9 ±0.1
$HD_{0,05}$	0.6	0.7	0.4	0.8	0.7	0.8

The biochemical composition analysis of the collection samples at the dry substance concen-tration, the sugars sum including mono - and disaccharides showed that the majority of them enlarge the standart on 13 – 46%, 11 – 48% and on 36 – 150%, except the samples B12132B (Australia) and Yaltinsky model №3 (Crimea), in which the concentration of the dry substance on 12 – 19% and the sugars sum on 2% lower than the standart sample, and the fraction of disaccharides is on 22% lower than sample 12 (Table 3). The highest concentration of the sugars sum and disaccharides is marked at samples Red Wethers field (Bolivia), Valensiya (Portugal) and Brown Beauty (USA). In the bulbs of sample Yaltinsky model №3 (Crimea) the increase of monosaccharides and ascorbic acid relatively on 10 and 47% higher than the standart was marked.

The maximal concentration of ascorbic acid in the bulbs contains at samples Red Wethers field (Bolivia) – 21.1 $mg.100g^{-1}$ and Yaltinsky model №3 (Crimea) – 27.3 $mg.100g^{-1}$, this is on 5 – 14% higher in comparison with the standart (18.6 $mg.100g^{-1}$). At *Allium cepa* L. samples under study for the years of the researches the weight fraction of the essential oil in the range from 0.9 till

6.2% that is typical for the salad breeds. The samples singled out according to the studied factors are used in the selection process. The results of electronic-microscopic researches of the tudied *Allium cepa* L. samples leaves allowed to distinguish the peculiarities of cuticle surface micromorphology (the presence of girders and folds, the wax layer), the peculiarities of the stomata position, as well as their length and the quantity on 1 mm^2 of *Allium cepa* L. leaf surface (Table 4).

The highest stomata quantity on the adaxial leaf side of *Allium cepa* L. leaf is observed on samples B12132B (Australia), Valensiya (Portugal), Tavrichesky (Crimea) and Trimontzium (Bulgaria) – 49.9 x 10^2, 47.4 x 10^2, 38.9 x 10^2 and 37.6 x 10^2 $pcs.mm^{-2}$ correspondently. At the majority of the samples the stomata length varies slightly from 8.71 µm (B12132B (Australia)) till 22.49 (Blood red flat (Netherlands)). The largest stomata – 34.32 µm is at sample Yaltinskiy rubin (Crimea), however, the stomata quantity on 1 mm^2 of the leaf surface is not essential – 37.6 x 10^2 pcs.

The stomata sculptural peculiarities of three main contrasting collection samples: Trimontzium (Bulgaria); Mestniy (Azerbaijan) and Yaltinsky rubin (Crimea) are presented on Figure 2.

It is determined that the leaf surface microstructure of each *Allium cepa* L. studied samples is specific. The cuticle wax which is mostly developed at Trimontzium (Bulgaria) is clearly seen. The analysis of leaves epidermis low surface ultrastructure showed that the stomata at *Allium cepa* L. studied samples are basically prolonged (the length is bigger than the width) with clearly seen auxiliary epidermal cells covered with wax layer. In relation to the cuticle surface level the stomata are placed differently, for example: at sample Trimontzium (Bulgaria) the stomata are strongly deepened in the cuticle, placed lower than the surface. At the sample Mestniy (Azerbaijan) the stomata are raised above the cuticle surface and have well developed girders that possibly provide the better stomatal pore opening and closing. At the sample Yaltinsky rubin (Crimea) the stomata are placed at the cuticle level and have well-developed stomatal rollers.

It is determined that the stomata length was larger and was 21.15 – 34.32 µm at more productive samples with thick rich skins and their quantities at the level of 5.4 – 5.8 pcs.

Table 4 Morphological factors of *Allium cepa* L. breeds vegetable part**.**

Breed	Stomata length, µm	Fluctuation limits		Stomata quantity $pcs.mm^{-2}$
		min	max	
Yaltinsky rubin (Crimea) – standart	34.32	28.28	38.87	32.1 x 10^2 ±287.4
1. Mestniy (Krasnodar, Russia)	26.98	20.10	34.51	19.7 x 10^2 ±287.3
2. B12132B (Australia)	18.71	16.97	19.31	49.9 x 10^2 ±399.8
3. Southport red (USA)	20.51	16.54	24.95	31.4 x 10^2 ±474.7
4. Trimontzium (Bulgaria)	20.34	16.23	22.92	37.6 x 10^2 ±349.8
5. Tavrichesky (Crimea)	19.67	16.23	25.83	38.9 x 10^2 ±398.4
6. Rouge pale (Algeria)	27.12	23.84	29.47	25.7 x 10^2 ±437.3
7. Mestniy (Azerbaijan)	21.15	14.96	31.23	25.5 x 10^2 ±599.7
8 Red Wethers field (Bolivia)	29.15	27.46	36.54	29.6 x 10^2 ±399.8
9. Blood red flat (Netherlands)	22.49	16.05	25.83	20.6 x 10^2 ±274.8
10. Valensiya (Portugal)	27.13	24.05	32.08	47.4 x 10^2 ±324.8
11. Brown Beauty (USA)	24.92	21.56	29.92	34.9 x 10^2 ±262,4
Average	26.19	20.19	29.29	32.78 x 10^2

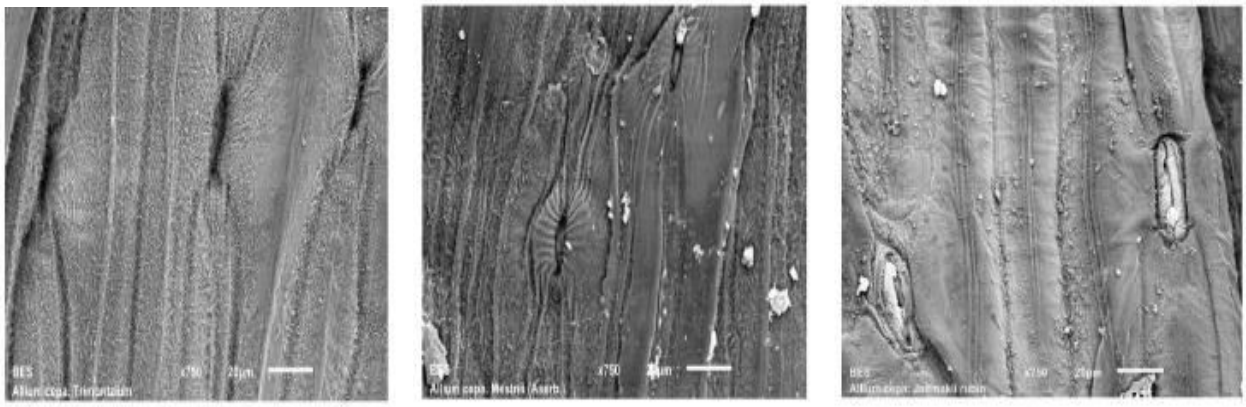

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Figure 2 The stomata position peculiarities of Alium cepa L. breeds 1 − Trimontzium (Bulgaria), 2 − Mestniy (Azerbaijan), 3 − Yaltinsky rubin (Crimea).

CONCLUSION

The complex evaluation of morphometric factors and biochemical composition of 13 *Allium cepa* L. collection samples of different ecology-geographic origin is given.

It is determined that *Allium cepa* L. samples are characterized by different bulbs colour that indicates about *Allium cepa* L. samples leaves add their morphologic characteristic that indicate the variental differences of the leaf epidermal structures and the various level of adaptability.

The studied collection of the southern subspecies *Allium cepa* L. samples is the base for the acquisition of the best samples according to the factors: the concentration of dry substance, sugars, ascorbic acid and essential oil and is used in the selection work for the improvement of flavouring and curing characteristics of the existing salad onion breeds.

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