

---

## CROP PRODUCTION

---

DOI: <https://doi.org/10.23649/jae.2020.1.13.1>

Kotsareva V.N.\*<sup>1</sup>, Shabetnya N.O.<sup>2</sup>

<sup>1,2</sup>Belgorod State Agricultural University named after V. Ja. Gorin, Belgorod, Russia

\* Corresponding author (knv1510[at]mail.ru)

Received: 01.02.2020; Accepted: 10.02.2020; Published: 09.04.2020

### RESTORATION OF VARIETAL FEATURES OF STRIGUNOVSKII MESTNYI BULB ONION CULTIVAR

Research article

#### Abstract

When analyzing the seeds of collection samples collected in the Borisov district of the Belgorod region, it was noted that the sown seeds were a hybrid population in which bulbs with an atypical shape and color were found. The number of seeds with a typical color for the Strigunovsky local variety was 48% and 39%, and only 13% and 16% in the shape of the bulb. Significant differences in the onset and passage of phenological phases, according to the morphological characteristics of the studied samples of onions, were not noted. Seed productivity of collection samples was 1.8-4.8 g.

**Keywords:** bulb onions, mother bulb, typicality, uterine onion, onion sets, selection, typical bulbs.

Коцарева Н.В.\*<sup>1</sup>, Шабетня О.Н.<sup>2</sup>

<sup>1,2</sup>Белгородский государственный аграрный университет имени В. Я. Горина, Белгород, Россия

\* Корреспондирующий автора (knv1510[at]mail.ru)

Получена: 01.02.2020; Доработана: 10.02.2020; Опубликована: 09.04.2020

### ВОССТАНОВЛЕНИЕ СОРТОВЫХ КАЧЕСТВ ЛУКА РЕПЧАТОГО СОРТА СТРИГУНОВСКИЙ МЕСТНЫЙ

Научная статья

#### Аннотация

При анализе семян коллекционных образцов, собранных в Борисовском районе Белгородской области отмечали, что высеваемые семена представляли собой гибридную популяцию, в которой встречались луковицы с нетипичной формой и окраской. Количество севка с типичной окраской для сорта Стригуновский местный составило 48 % и 39 %, а по форме луковицы – всего лишь 13% и 16%. Существенных различий по наступлению и прохождению фенологических фаз, по морфологическим признакам изучаемых образцов лука репчатого не отмечали. Семенная продуктивность коллекционных образцов составила 1,8-4,8 г.

**Ключевые слова:** типичность, маточный лук, лук севок, селекция, типичность луковиц.

#### 1. Introduction

Onion is one of the most ancient vegetable crops cultivated by man. According to N. I. Vavilov theory, the center of origin of bulb onion varieties is considered to be located in the Mediterranean, where local sorts of onion were obtained by the means of folk mass selection [1]. These include the bulb onion cultivar Strigunovskii mestnyi with more than 400-year history according to the chronicles. The people of the village started its extensive cultivation in the 18th century. It was distributed not only to local markets, but also to all the southern towns of the Russian Empire, as well as to world markets [2]. This native to the Belgorod region variety carries such economic properties as high keeping quality [3], [4]. At the beginning of the 20th century Strigunovskii mestnyi bulb onion cultivar was awarded Gold Medal at The World Fair in Paris. In 1943, this variety was introduced into the National Register of selection achievements. In 1961, Kolkhoz named after Lenin in Borisovka district of the Belgorod region was awarded Grand Silver Medal for extra qualities of Strigunovskii mestnyi onion cultivar at Erfurt international agricultural exhibition of socialistic nations [5], and the cultivar itself won a gold medal in 1974 at Leipzig spring fair. Strigunovskii mestnyi onion cultivar has become the trademark of both the village and the district [6]. The commercial yield of onion was equal to more than 6000 tons per year. Today in Strigunov very few private farmsteads keep growing it, while primary seed breeding of onion is not present at all [7].

At the end of 1990s the laboratory of vegetable crops primary seed breeding of Belgorod State Agricultural Academy was maintaining varietal features of bulb onion [8], [9], [10], but in the next years this activity was stopped due to the spread of

foreign cultivars and hybrids. In 2014 on the resolution of the regional government, the onion selection laboratory was created in Belgorod SAU (Belgorod State Agricultural University) in order to restore varietal features of Strigunovskii mestnyi cultivar and its primary seed breeding to phase out import.

## 2. Materials and methods

The aim was set to create nursery for original strains of Strigunovskii mestnyi cultivar. In order to attain aims following tasks were defined and completed: to examine the collection of local samples of Strigunovskii mestnyi bulb onion, to perform selection of planting stock (seed onion and mother bulbs) by morphological features, to study bulb conservation, to separate typical sample for further selection, to examine seed productivity of bulb onion plants.

**Study subjects** include mother bulbs, seed onion, seeds of bulb onion; the target of research is the potential for restoration of Strigunovskii mestnyi cultivar in the Belgorod region. The study was performed according to existing guidelines and developed plan. The selection of bulb onion was carried out as is described below:

1. Sowing samples from the collection, obtaining seed onion, selection of typical stock (2014, 2015);
2. Sowing original stock, obtaining seed onion, selection of typical stock (2015);
3. Cultivation of onion mother bulbs. Assessment of original stock plants, selection of the best mother bulbs (2014, 2015);
4. Seed-breeding plots cultivation within isolated plots. Separate collection of seeds from each plant (2015).

The nursery for original strains of Strigunovskii bulb onion cultivar was established within the laboratory of vegetable crops selection and seed breeding of Belgorod SAU. Mother bulbs were planted out in early spring at separate plots in the Belgorod region farms. Phenological observations and biometry were performed during the growth season (April-August).

## 3. Results

The main task in course of seed onion cultivation is to obtain maximum quantity of well-matured bulbs – bottom sets of conventional size, which is specified for certain cultivar groups. The analysis of population structure and norms of reaction within the populations is based on the results of phenotypic observations of individual plants. Plants should be grown on the stabilizing background according to the agrotechnical conditions of variety breeding and reproduction, accepted by the industry of the region.

The analysis of collection samples' seeds gathered in Borisovka district of the Belgorod region indicates that the seeds planted represented a hybrid population, which included bulbs of atypical form and colour. The proportion of ordinary coloured seed onion in Strigunovskii mestnyi variety was equal to 48% (2014) and 31% (2015), while the proportion of ordinary shaped ones was equal to 13% and 16% respectively (Table 1). These observations confirm the lack of primary seed breeding of this cultivar.

Table 1 – Analysis of seed onion originating from the seeds of Strigunovskii mestnyi cultivar, sowed in the Belgorod region, %

Fraction	2014	2015
Seed onion with yellow bulbs	48	31
Including bulbs of ordinary shape	13	16
Seed onion with atypically coloured bulbs	52	69
Including red bulbs	51	69
White bulbs	1	0

The analysis of eight samples of seed onion culture of 2014 from the Borisovka district farms revealed the emergence of bolters at a rate of 7% (D5-14) to 51% (D9-14) (Table 2).

Table 2 – Structure of seed onion culture yield in 2014 from the Borisovka district farms, % (2014)

Sampling index	Seed onion		Yield					Mother bulb weight, g
	Nonbolting.	Bolting.	Selected onion	Seed onion	Mother bulbs, total	Including		
						atypical	ordinary	
<b>D1-14</b> (Striguny v.)	60	40	100	0	0	0	0	-
<b>D2-14</b> (Striguny v.)	100	0	100	0	0	0	0	-
<b>D3-14</b> (Striguny v.)	63	37	41.5	0.4	58.1	19.6	38.5	34.1
<b>D4-14</b> (Striguny v.)	69	31	5.7	3.0	91.3	12.7	78.6	47.8
<b>D5-14</b> (Striguny v.)	93	7	26.0	3.0	71.0	4.0	67.0	46.5
<b>D8-14</b> (Kryukovo v.)	100	0	23.1	0	76.9	0	76.9	42.4
<b>D9-14</b> (Striguny v.)	49	51	5.0	0.3	94.7	9.3	85.4	47.5

No bolting was observed in D2-14 (Striguny v.) and D8-14 (Kryukovo v.) samples of the samples from the collection, in all the other cases plants were shooting out. Samples D1-14 (Striguny v.) and D2-14 (Striguny v.) did not form mother bulbs. Yield structure for other samples included 5.7% to 41.5% of selected onion and 0.3% to 3% of seed onion.

In 2014 mother bulb weight varied from 34.1 to 47.8 grams. The proportion of mother bulbs in the yield structure ranged from 58.1 to 94.7%, whereas the proportion of onion bulbs suitable for planting – from 68% to 88% (Table 3).

Table 3 – Condition of mother bulbs as at 01.04.2015, %

Sampling №№	Bulbs		
	suitable for planting	sprouting	diseased
S3-14 (Striguny v.)	86	14	0
S4 -14(Striguny v.)	69	24	7
S5 -14(Striguny v.)	88	9	3
S8 -14(Kryukovo v.)	69	26	5
S9 -14(Striguny v.)	68	29	3
S10-14 (Komsomolets s.)	87	20	3

The highest proportion of sprouting mother bulbs was observed in samples S9-14 (Striguny v.), S8-14 (Kryukovo v.), S4-14 (Striguny v.) – 29%, 26% and 24% respectively. The proportion of diseased bulbs ranged from 0% in S3-14 (Striguny v.) to 5% S8-14 (Kryukovo v.).

No significant difference in the onset and the flow of phenological stages, plant height, number of flower stalks was observed in the examined samples (Table 4). Seed productivity varied from 1.8 grams in sample S5-14 (Striguny v.) to 4.8 grams in samples S8-14 (Kryukovo v.) and S10-14 (Komsomolets s.). The seeds were picked out for further selection.

Table 4 – Display of economic traits in samples of mother bulbs in the yield of 2014

Sampling №№	Days from planting to				Plant height	Number of flower stalks	Seed productivity, g per plant
	aftergrowing	shooting out	blossoming	ripening of seeds			
S3-14 (Striguny v.)	18	36	46	138	102±2.1	2.1	4.6
S4 -14(Striguny v.)	18	36	46	138	101±1.9	2.1	3.9
S5 -14(Striguny v.)	18	36	46	138	103±2.2	1.8	1.8
S8 -14(Kryukovo v.)	18	35	45	136	103±3.1	2.8	4.8
S9 -14(Striguny v.)	18	36	44	136	102±2.7	2.3	3.9
S10-14 (Komsomolets s.)	18	35	45	136	102±2.7	2.7	4.8

Selected onion (0% to 7%) and seed onion (93% to 100%) was observed in the heap of bulbs of 2015 (Table 5).

Table 5 – Form and colour variability in seed onion in 2015, % (2015)

Sampling index	Yield			
	Selected onion	Seed onion, total	Proportion of form and colour varieties of total	
			typical	atypical
D1-15.	3	97	84	18
D2-15	3	97	83	17
D3-15	4	96	78	22
D4-15.	6	94	89	11
D5-15	2	98	79	21
D6-15	2	98	91	9
D7-15	1	99	96	4

Table 5 continuation – Form and colour variability in seed onion in 2015, % (2015)

Sampling index	Yield			
	Selected onion	Seed onion, total	Proportion of form and colour varieties of total	
			typical	atypical
D8-15	1	99	81	19
D9-15	5	95	79	21
D10-15	0	100	98	2
D10-15	0	100	94	6
D11-15	0	100	96	4
D12-15	0	100	99	1
D13-15	2	98	89	21
D14-15	1	99	87	23
D15-15	7	93	74	26
D16-15	3	97	76	24
D17-15	3	97	84	16
D18-15	3	97	97	3
D19-15	1	99	97	3
D20-15	2	98	89	11
D21-15	1	99	100	0
D22-15	2	98	100	0
D23-15	3	97	98	3
D24-15	3	97	89	11
D25-15	3	97	91	9
D26-15	4	96	93	7

Proportion of seed onion, typical in colour and shape, in total heap in samples of Strigunovskii mestnyi original strains from the nursery varied from 74% to 100%. Selected seed onion was stored for further reproduction.

Therefore, initial stock for the restoration of varietal features of Strigunovskii mestnyi bulb onion was obtained due to mass selection.

**Conflict of Interest**

None declared.

**Конфликт интересов**

Не указан.

**References**

1. Pivovarov V.F. Selection and seed breeding of vegetable crops. / V.F. Pivovarov. – M.: VNISSOK, 2007. – P.612-625.
2. Mediatron [Electronic resource]. – URL: <http://www.mediatron.ru/news-2013-avg-027190.html> (accessed: 16.09.2014).
3. Vegetable seed breeding practice with the elements of seed studies / edited by V.A. Ludilov and Yu.B. Alekseev. – M.: *Tovarishchestvo nauchnyh izdaniy KMK*, 2011. – P.132-144.
4. Prokhorov I. A. Selection and seed breeding of vegetable crops / I. A. Prokhorov, A. V. Kryuchkov, V.A. Komissarov. – M.: Kolos, 1997. – P.213-229.
5. Belpressa [Electronic resource]. – URL: <http://www.belpressa.ru/news/news/strigunovskii-luk-dom-dlya-molodyh-specialistov-skalodrom/> (accessed: 16.09.2014).
6. Borisovka [Electronic resource]. – URL: <http://www.borisovka.info/settlement/striguni/References> (accessed: 2.10.2014).
7. Kotsareva N.V. Relevance of vegetable seed breeding in the region /N.V. Kotsareva // *Belgorodskii agromir*, 2007. – № 2. – P. 30-32.
8. Kotsareva N.V. Economical and biological characteristics of local bulb onion cultivars / N.V. Kotsareva, V.M. Timchuk, S.M. Timchuk // *Proceedings of I International conference: Intensification of horticulture production – Belgorod*, 1997. - P. 68.
9. Kotsareva N.V. Enhancement of efficiency of onion seeding culture / N.V. Kotsareva, V.M. Timchuk, S.M. Timchuk // *Proceedings of I International conference: Intensification of horticulture production – Belgorod*, 1997. – P. 51.
10. Kotsareva N.V. Examination of bulb onion seed-breeding plots features / N.V. Kotsareva, V.M. Timchuk, S.M. Timchuk // *Proceedings of I International conference: Intensification of horticulture production – Belgorod*, 1997. – P. 49.