The productivity of onion (Allium cepa L.) in seed crops

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Abstract. The article deals with the issues of selection and seed production of onion (Allium cepa L.). Breeding studies were conducted in the nursery of the Belgorod state agrarian UNIVERSITY in 2016-2017. The influence of the fraction size on the yield and structure of onion crops (Allium cepa L.) was studied. It was found that plants in the 1st and 2nd families performed better when planting a large fraction of sowing. The yield in these variants was 2.76-3.05 kg/m², the density of crops was 172-191 plants per 1 m². Skirmished plants were not observed when planting a large fraction of onion-sowing. Thus, it is recommended to use samples of these 2 families to continue the selection process.

1. Introduction
Onion seed production is the most labor-intensive process in comparison with seed production of other vegetable crops. This is due to the fact that onion seeds are grown in two- and three-year development cycles. Depending on the biological characteristics of the variety and the zone of cultivation, the duration of seed cultivation varies. No other crop has a complex of agrotechnical measures that depends so much on zonal and varietal characteristics as onions [1-6].

The main task in growing onion-sowing is to obtain the largest number of well-ripened bulb-sowing of the standard size established for certain groups of varieties. This is achieved by applying the optimal seeding rate, which is determined by their economic viability, soil fertility, the amount of precipitation during the growing season, and irrigation [7-10]. Therefore, an urgent task is to carry out work to restore the varietal qualities of onions of the strigunovsky local variety.

2. Materials and methods
The research was conducted in 2016-2017 on the basis of the Department of breeding, plant and vegetable production. Selection studies were carried out by the method of family selection. For this purpose, 16 families were laid in the breeding nursery of the Belgorod state agrarian university, the area of the plot is 36 m². In the course of the experiment, the influence of the onion-sowing fraction on economically valuable traits of onion (Allium cepa L.) of the strigunovsky local variety was also studied.

3. Results
As parent plant, bulbs are selected:

- In small-sized ones—with a diameter of 7-8 cm or more (weight for varieties with an average bulb of 70-80 g);
For varieties with large bulbs-100-120 g. The use of a certain size of sowing allows you to get high yields of mother onions with characteristic nesting capacity, bulb size, precocity and friendly maturation. Agrotechnics of onion-sowing is common.

Ripened onion-sowing is removed, matured and dried. Dried and warmed at a temperature not higher than 30-35 °C, the sowing is processed on PML-6 lines with otminkovy machines. With small volumes, the tops are minted manually. From 1 m³ of a heap of sowing after otminki leaves it turns out about 0.7 m of dry onion-sowing. Weight of 1 m³ of onion-sowing 580-600 kg. Sorting and calibration of onions-sowing is carried out on the SLS-7A onion sorting. Harvest of onions-sowing 10-20 t/ha and more.

On 1 ha of the mother plot, onion-sowing of low-seed varieties is laid, taking into account the natural loss during winter storage of 10-12 °C. Store onions after drying in storages warm (temperature 18-20 °C) or warm-cold way (in the fall at a temperature of 18-20 °C, at the onset of winter - at -1...-3 °C, in spring-at 18-20 °C).

In the spring, 10-14 days before planting, the seeds are warmed up at 40 °C for 8 hours. Warming prevents plants from shooting, is a measure to combat false powdery mildew, accelerates plant growth and increases the yield of mother onions.

In the course of vegetation observations of onion crops (Allium cepa L.), the following structure of crops was established (table 1).

| Variant | Density of standing plants, pcs/m² | Quantity of arrow plants, pcs/m² |
|---------|-----------------------------------|----------------------------------|
|         | large fraction | small fraction | large fraction | small fraction |
| F-1     | 191            | 76             | 0              | 3             |
| F-2     | 172            | 53             | 0              | 13            |
| F-3     | 58             | 40             | 0              | 1             |
| F-4     | 46             | 61             | 0              | 4             |
| F-5     | 48             | 117            | 0              | 19            |
| F-6     | 40             | 26             | 0              | 0             |
| F-7     | 72             | 127            | 0              | 15            |
| F-8     | 68             | 60             | 0              | 15            |
| average | 86.9           | 69.9           | 0              | 8.8           |

The largest number of plants planted in the large fraction per 1 m² was in the 1st and 2nd families – 191 and 172 plants, respectively. The lowest density was observed on the 4th and 5th families – 46.0-48.0 plants per 1 m². The remaining plant variants also had less than the average number of plants. When planting small fraction, the most plants were observed on 5 and 7 families – 117 and 127 plants per 1 m². The lowest number of plants was observed on 6 families – 26 pieces/m².

When planting a large fraction of arrow plants in onion crops was not observed. In the small fraction crops, the most arrow plants were in 5 families – 19 pieces/m², and the least in 3 – one plant and in 6 – they were not at all. Higher than average was observed in 2, 7 and 8 families.

It was found that the lowest yield of commercial onions of large fraction in the range of 0.69-0.94 kg/m² was in families 3, 4, 5, 6 (table 2). The average yield was Higher in variants F-1 and F-2, and it was 3.05 and 2.76 kg/m², respectively. The yield of onions of small fraction was significantly lower,
the excess of the average yield was observed in experiments 4, 5 and 7, and in other cases the yield was less than one kg/m$^2$.

Table 2. Yield of onion (Allium cepa L.), sort Strigunovsky local, 2017.

| Variant | Onion yield, kg/m$^2$ | Bulb weight, g |
|---------|-----------------------|----------------|
|         | commercial onions     | onion-selections |
|         | large fraction        | small fraction  | large fraction | small fraction |
| F-1     | 3.05                  | 0.85           | 0.64          | 0.15          | 159.5          | 112.0          |
| F-2     | 2.76                  | 0.74           | 0.28          | 0.09          | 160.3          | 137.5          |
| F-3     | 0.87                  | 0.40           | 0.25          | 0.02          | 149.0          | 100.0          |
| F-4     | 0.69                  | 0.92           | 0.09          | 0.50          | 150.0          | 151.0          |
| F-5     | 0.94                  | 1.62           | 0.15          | 0.73          | 195.0          | 139.0          |
| F-6     | 0.77                  | 0.34           | 0.10          | 0.16          | 193.0          | 131.0          |
| F-7     | 1.14                  | 1.55           | 0.33          | 0.74          | 158.0          | 122.0          |
| F-8     | 1.06                  | 0.60           | 0.34          | 0.14          | 156.0          | 100.0          |
| average | 1.41                  | 0.88           | 0.27          | 0.32          | 165.1          | 124.1          |

The yield of commercial onions in 1 family was more than 2 times higher than the average yield, and amounted to 3.05 kg/m$^2$. The same ratio was observed in the analysis of the onion sample, where the excess over the average was 2.4 times. This is the highest yield when planting a large fraction of onions. The yield of commercial onions was 2.76 kg/m$^2$. In other cases, the collection was below average. The lowest yield of commercial onions of large fraction was in 4 and 6 families, and amounted to 0.69 and 0.77 kg/m$^2$, respectively. When assessing the yield of commercial onions of small fraction, a low level was noted in 3 and 6 families.

The yield of sample onions was lower than the yield of commercial onions in all families. The size of the seed material in this case did not have a significant impact and was at the same level – 0.27-0.32 kg/m$^2$ on average for all families.

The mass of the bulb coarse fraction varied from 149.0 to 195.0 g, the largest specimens observed in 5 and 6 families, and the smallest is 3 and 4. The bulbs of the fine fraction is much less than in large, the mean weight was 41.0 g. A larger had a bulb in 5 family (151.0 g) and the smallest 3 and 8 families (100.0 g).

4. Discussion
When analyzing the structure of onion crops (Allium cepa L.), it can be said that the size of the onion-sowing fraction did not affect the density of standing plants. The differences between different families are too large, so in 1 and 2 families the density is higher when planting a large fraction, and in 4, 5 and 7, on the contrary, when planting a small one. Moreover, in 5 families, this excess was 2.4 times. Such an uneven distribution of plants over the area of the plot is probably due to soil fertility, which will be studied in further studies.

In the crops of a large fraction of onion-sowing, in contrast to the crops of a small fraction, there were no arrow plants, which indicates sufficient resistance of this onion to early frosts, the yield will be higher and better stored.
It is natural that the yield is higher in 1 and 2 families when planting a large fraction, so there is a higher density of standing plants. However, the mass of one bulb is greater in 5 and 6 families, which is also explained by the fact that the density of crops is less frequent, and the area of nutrition is higher for one plant. The same pattern is observed in small fraction crops – both the yield and the density of standing plants are higher in 5 and 7 families.

5. Conclusion
Thus, it can be concluded that further selection is recommended to select bulbs of the 1st and 2nd families - for a large fraction and 5 and 7 families – for a small one. In addition, to obtain high yields, frost-resistant and well-preserved, preference should be given to a larger onion-sowing.

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