Effect of pre-sowing treatment of onion seeds (Allium cepa L.)

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Abstract. The article examines the effectiveness of pre-sowing seed treatment on the structure of the onion crop. It was found that treatment with Probiotic (1:100), Eco-organic (0.1), with a content of silver nanoparticles (30 ppm) contributed to the production of onions (Allium cepa L.) with a bulb diameter of 15.1-22 mm in an amount of 71.5 to 84.0 %.

1. Introduction
Onion (Allium cepa L.) occupies one of the first places among other vegetable crops, both in terms of acreage and gross harvest. So in 1970, the area under onion crops in all countries was 900 thousand hectares. The yield of commercial onions also increased from 12.9 t/ha in 1970 to 16.7 t/ha in 1997.
One of the main factors that determine the yield and quality of onions is the planting time. In this regard, the study of the influence of the size of the fraction and the timing of planting on the economically valuable characteristics of the royal bulbs of onions seems to us relevant [1-10].

2. Materials and methods
The research was conducted in 2016-2017 on the basis of the department of Breeding, Plant and Vegetable Production. In the experiment, the effect of pre-sowing preparation of onion seeds (Allium cepa L.) with growth-regulating preparations was studied: sowing with dry seeds-control; soaking in water; soaking in Probiotic, (1:10, 1:20, 1:50, 1:100); soaking of Eco-organic (0.01%, 0.04%); soaking in solutions of the preparation with silver nanoparticles (100 ppm, 50 ppm, 30 ppm, 20 ppm, 10 ppm, 5 ppm, 3 ppm, 1 ppm) on the structure of the crop.

The objects of the study were onion seeds of the Strigunovsky Local variety of the Belgorod region.

3. Results
To get good yields before planting bulbs should be sorted by size-fractions (figure 1). Each fraction will then be planted separately (the smaller the bulbs, the smaller the distance between them in a row).

There is the following division into fractions:

- 10-15 mm – the smallest. This is the optimal size for winter planting, the onion does not shoot, but too small bulbs have a chance of freezing. For spring planting, the size is very small, there may be a delay in maturation from the average fraction of about 3 weeks (small bulbs are obtained on poor soil);
- 15.1-22 mm-average fraction. It is widely used for winter planting. The bow does not shoot. The best size for planting in the spring;
22.1-40 mm – large fraction. Designed for winter planting – only on greens. During spring planting, it is possible to shoot certain varieties with improper storage or early planting (when the temperature changes sharply), but its advantage is in early maturation and guaranteed yield.

![Sorting onion-sowing](image1.png)

Figure 1. Sorting onion-sowing (Allium cepa L.) by fractions.

Figure 2 shows the onion (Allium cepa L.) crops in 2017.

![Plantings of onions](image2.png)

Figure 2. Plantings of onions (Allium cepa L.).

The structure of the crop of onions of the Strigunovsky local variety, depending on the pre-sowing treatment of seeds, is presented in table 1.

In the control group, the most bulbs were of the average fraction – 64.5 pieces, and less – small. When soaking with water, a more uniform distribution between the fine and medium fractions was observed – 43.5 and 34.5 pieces, respectively.

When processing with probiotic in different concentrations, the most common were the bulbs of the average fraction, while the most was when diluting 1:100 – 71.0 pieces.

After using Eco-organic, there were also more medium-sized bulbs, the best concentration was 0.1%. At a concentration of 0.4%, there was a slight deviation towards the fine fraction.
Table 1. Influence of pre-sowing treatment of seeds on the yield structure of onion (Allium cepa L.), 2016-2017.

| Variant                  | Quantity of bulbs by fractions, pieces |
|--------------------------|----------------------------------------|
|                          | 10-15 mm | 15.1-22 mm | 22.1-40 mm | Total  |
| Without processing - control | 14.5     | 64.5       | 21.0       | 100.0  |
| Water                    | 43.5     | 34.5       | 22.0       | 100.0  |
| Probiotic, 1:10          | 30.0     | 67.5       | 2.5        | 100.0  |
| Probiotic, 1:50          | 27.5     | 65.0       | 7.5        | 100.0  |
| Probiotic, 1:100         | 19.5     | 71.0       | 9.5        | 100.0  |
| Eco-organic, 0.1         | 12.0     | 84.0       | 4.0        | 100.0  |
| Eco-organic, 0.4         | 25.0     | 67.0       | 8.0        | 100.0  |
| Ag ppm 3                 | 24.0     | 71.0       | 5.0        | 100.0  |
| Ag ppm 5                 | 22.0     | 67.5       | 10.5       | 100.0  |
| Ag ppm 10                | 26.0     | 60.5       | 13.5       | 100.0  |
| Ag ppm 20                | 28.5     | 66.5       | 4.5        | 100.0  |
| Ag ppm 30                | 14.0     | 79.5       | 11.0       | 100.0  |
| Ag ppm 50                | 21.0     | 70.0       | 9.0        | 100.0  |
| Ag ppm 100               | 11.0     | 69.0       | 20.0       | 100.0  |

The use of preparations with silver nanoparticles with different concentrations is also most common bulbs with a diameter of 15.1-20 mm, and more of them were used when using the following dilutions - 3 ppm, 30 and 50 - the number of bulbs was 71.0, 79.5 and 70.0 pieces, respectively. The smallest number of bulbs of the average fraction was observed on variants 10 and 20 ppm – 60.5 and 66.5 pieces, respectively.

Bulbs of large fraction were most often found without treatment, when soaked in water and in a preparation with 100 ppm silver nanoparticles, their number was 21.0, 22.0 and 20.0 pieces, respectively.

4. Discussion
Onion seeds have a strong horn-shaped shell and the endosperm contains essential oils, so the period of germination of the crop strongly depends on the soil moisture.

In optimal conditions, onion seeds germinate for 5-12 days, and at low temperature and lack of moisture - for 20-25 days, so to accelerate the emergence of onion shoots, use the method of soaking. The use of water was inefficient, as the seeds did not receive enough nutrients in the initial stages of growth and the final harvest was small.

The use of probiotic in the specified concentrations also proved to be ineffective compared to the control, the number of medium bulbs was slightly higher, but there were more small bulbs than large ones.
The use of preparations with silver nanoparticles had a positive effect on the structure of the resulting onion crop, this is due to the fact that silver even in small concentrations has bactericidal, fungicidal and virulent properties.

5. Conclusion
Thus, as a result of the analysis of the structure of the onion crop, it was found that pre-sowing treatment of onion seeds with Probiotic (1:100), Eco-organic (0.1), with a content of silver nanoparticles (30 ppm) provided the production of onions with a diameter of 15.1-22 mm from 71.5 to 84.0 % the use of preparations for pre-sowing treatment of onion seeds contributed to the production of improved planting material.

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