

## COMPARATIVE PHYSIOLOGY, BIOCHEMISTRY AND CELLULAR STUDY BETWEEN KARATALSKIY VARIETY AND SABZA VARIETY ONIONS SEED

Allaf Shayan Sayyid Ali Sayyid Mohammad<sup>1\*</sup>, Madina Abishova<sup>2</sup>, Arif Gaziye<sup>3</sup>

<sup>1</sup>Laboratory of Molecular Biology and Biotechnology, Department of Biology, Azerbaijan State Agricultural University, Ganja, Azerbaijan

<sup>2</sup>Department of Ecology, Azerbaijan State Agricultural University, Ganja, Azerbaijan

<sup>3</sup>Department of Biology, Azerbaijan State Agricultural University, Ganja, Azerbaijan

**Abstract.** The aim of the paper is to compare the physiological, biochemical and cellular characteristics of the local onion variety “Sabza” and the introduced onion variety “Karatalskiy”. The chemistry of the seed and its physiological activity, the percentage of seed germination and germination speed, seed energy and adaptation conditions were investigated by the physiological method. Also, the buds were examined macroscopically and microscopically at the cellular level, and the size and structure of the cells were statistically analyzed.

**Keywords:** onion, speed, energy of seed, microscopic analysis.

**Corresponding Author:** Sayyid Al, Allaf Shayan Sayyid Mohammad, Laboratory of Molecular Biology and Biotechnology, Department of Biology, Azerbaijan State Agricultural University, Ganja, Azerbaijan, Phone: 0514292248, e-mail: [saashayan@gmail.com](mailto:saashayan@gmail.com)

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### 1. Introduction

Considering that the agricultural areas in the world are shrinking due to various reasons and the population is increasing rapidly, one of the biggest problems of humanity today emerges as insufficient or poor-quality nutrition. Therefore, it is of great importance to increase the production of good quality nutrients. This means developing new varieties with high yield and quality and adapting to different environmental conditions.

It will be possible by keeping the seeds of different varieties in good conditions. One of the most important materials for this aim is vegetables seed cultivation. Therefore, researches are still continuing on the production of high-quality seeds and their economic storage for many years.

Onion (*Allium cepa* L.) is a vegetable that enters the kitchen of every household in Azerbaijan as well as all over the world, regardless of the income level of the consumers. Onion, which gives taste and aroma to the dishes, ranks third in the world production amount after potato and tomato. Seed has an important place in plant production inputs. Suitable climate, water, fertilizer and other requirements, seed quality also directly affects the amount of production (Duman, 2001).

Onion is an important plant with more than 700 species belonging to the genus *Allium* (Shrestha, 2007). Onion is one of the vegetables with a great variety when examined considering its different characteristics. Onion, which is abundant in vitamins and minerals (such as Vitamin C, Calcium, Iron) in its content, also has antiseptic properties due to the sulfuric substances it contains (Gunay, 2005).

It is shown that this vegetable is of great importance in terms of its nutritional and medicinal properties, as well as its widespread use in food (Konijnembur, 2009).

Also, onion is a very important medicinal plant. The use of boiled and powdered onion seeds increases sexual power and helps to eliminate kidney stones and is antibacterial. It is also used in prostate gland diseases, cleaning the bladder and urinary tract (Sanei, 2016) .

Based on the above information, in this research, 2 variety of onion plants (green and caratal) were examined and compared, and the difference between the species was determined in laboratory conditions.

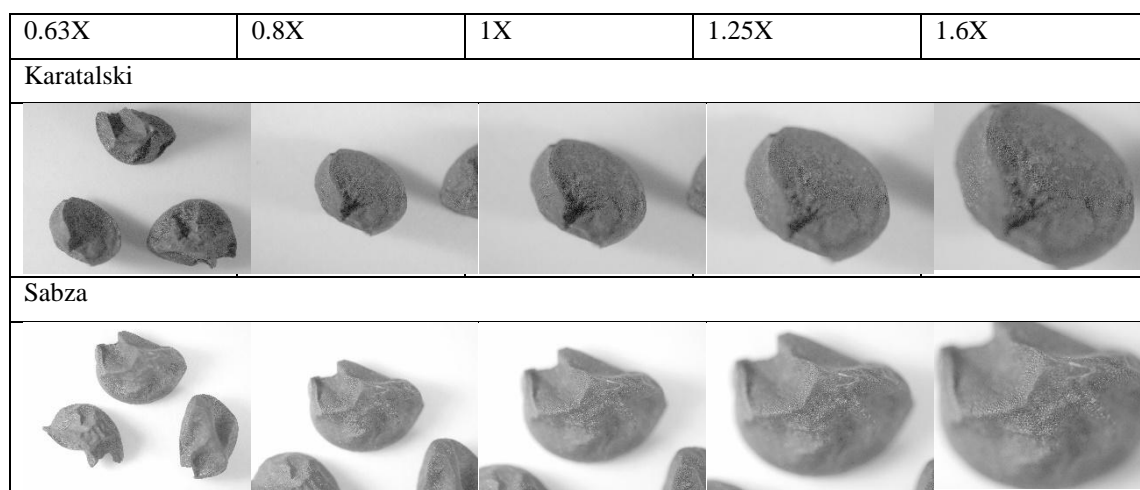
One of varieties is the regional onion cultivars is "Sabza" which was developed by the indigenous people of Azerbaijan and other variety is "Karatal'skiy" which was developed in 1959 (The time-tested onion variety "Karatal'skiy") by the Kazakhstan Research Institute of Growth Sciences.

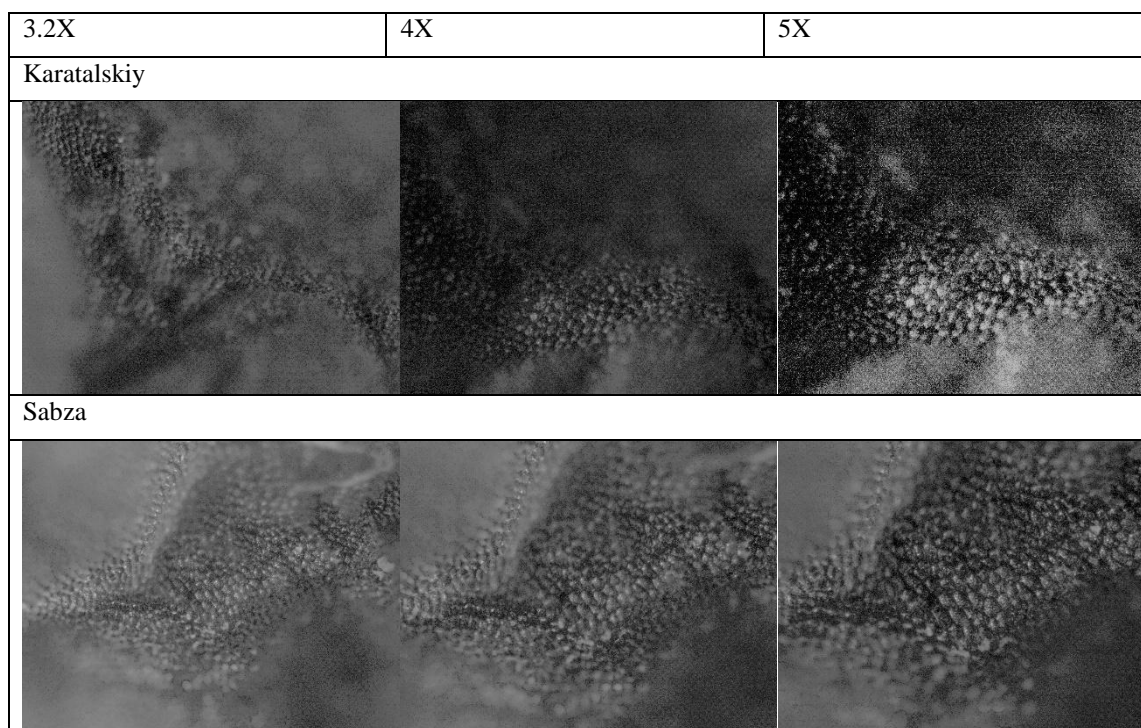
## 2. Materials and Methods

The experiment was carried out in Biotechnology and Molecular Biology Laboratory of Biology Department of the Azerbaijan State Agricultural University between "Sabza" and "Karatal'skiy" onions varieties's seed.

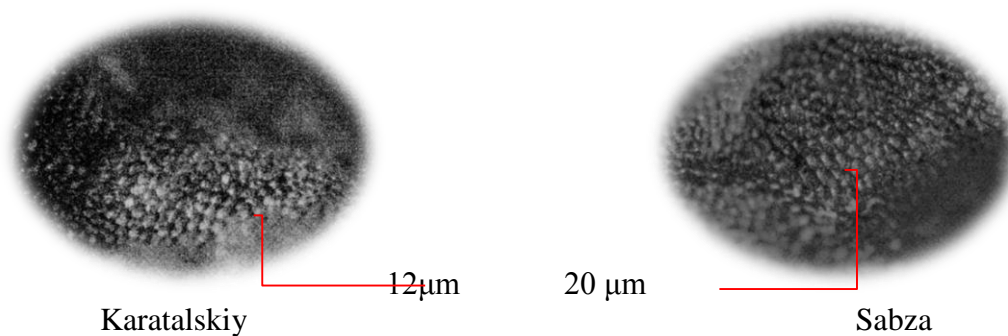
In the first step, the seeds were morphologically evaluated using a Stemi 508 stereo microscope. In the studies conducted on the seeds, the difference between the two cultivars was observed. After soaking, the effects of water on the seeds were observed and the seed coat was also evaluated. The Figure 1 clearly show the difference between the seeds.

Microscopic measurement with maximum magnification showed that seed guard cells (sporoderm) in "Karatal'skiy" variety have higher density and smaller cell size than "Sabza" variety, and also, "Karatal" variety itself has smaller size than "Sabza" variety.

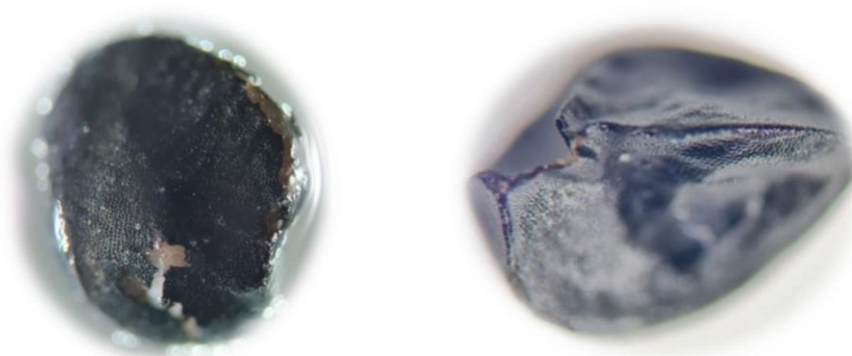




**Figure 1.** Morphological analysis of seeds with Stemi 508 microscope



**Figure 2.** Comparison of cell sizes in microscopic analysis of "Karatalskiy" and "Sabza" cultivars



**Figure 3.** Microscopic analysis of seeds after soaking

The effect of water on the seeds was examined microscopically and the condition of the sporoderm was observed after one hour of soaking. The observations showed that the rate of water absorption in two cultivars and the severity of seed cracking based on turgor are different in the two cultivars. The picture shows the state of the seeds after soaking.

Then the weight of 100 seeds was evaluated as a standard and the difference between the two cultivars was observed. The obtained data clearly show the difference between the two cultivars, the weight of 100 green seeds was 0.396 grams and the weight of "Karatal'skiy" was 0.492 grams. The measurement was done with a electronic scale model Baushi with an accuracy of 0.001 and an dg rate of 1%.

The volume of 100 seeds was measured for each variety. The measurements showed differences for each variety, the volume of 100 seeds was 200 microliters for the green variety and 120 microliters for the "Karatal'skiy" variety.

The density of the seeds was calculated according to the ratio of weight to volume, and based on that, the amount of endosperm was evaluated. The obtained data are shown in the Table 1.

**Table 1.** Weight, volume and density in dry seeds

Varieties	Weight/g	Volume mkl	Density g/mkl
Sabza	0,396	200	0,00198
Karatal'skiy	0,412	120	0,00343

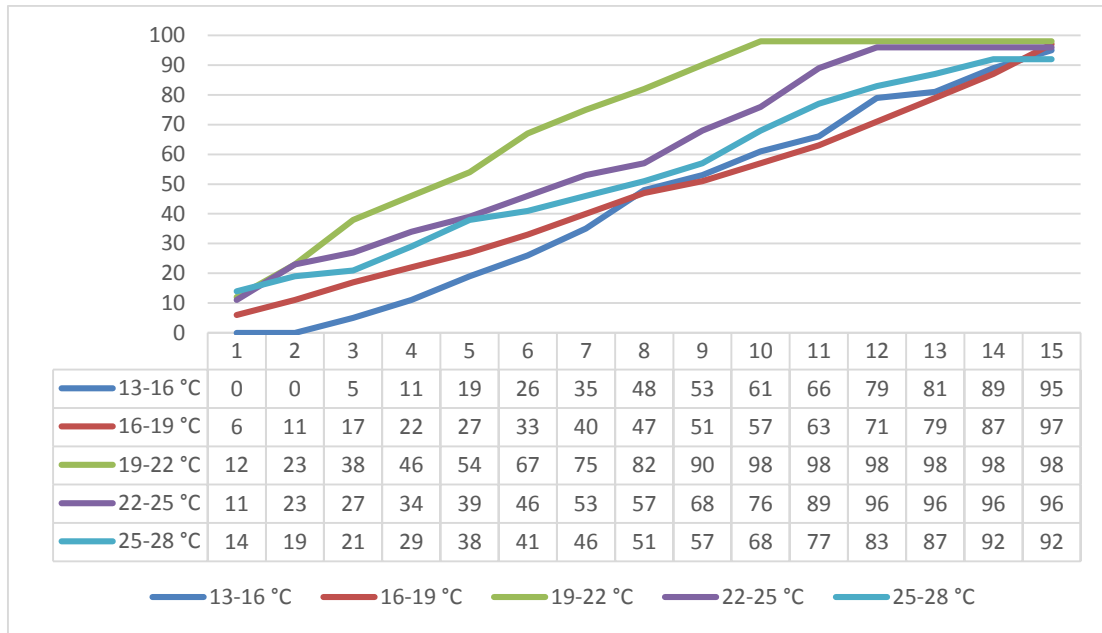
To evaluate the percentage of germination, the seeds were incubated in Binder seed germinator at temperatures of 13-16, 16-19, 19-22, 22-25 and 25-28 degrees Celsius and 60% humidity. Seed germination was calculated for 100 seeds.

Incubation at different temperatures for each variety showed different growth rate and germination percentage at different temperatures. The growth curve for each seed is shown in the graphs. And the optimal temperature was calculated for each of the varieties.

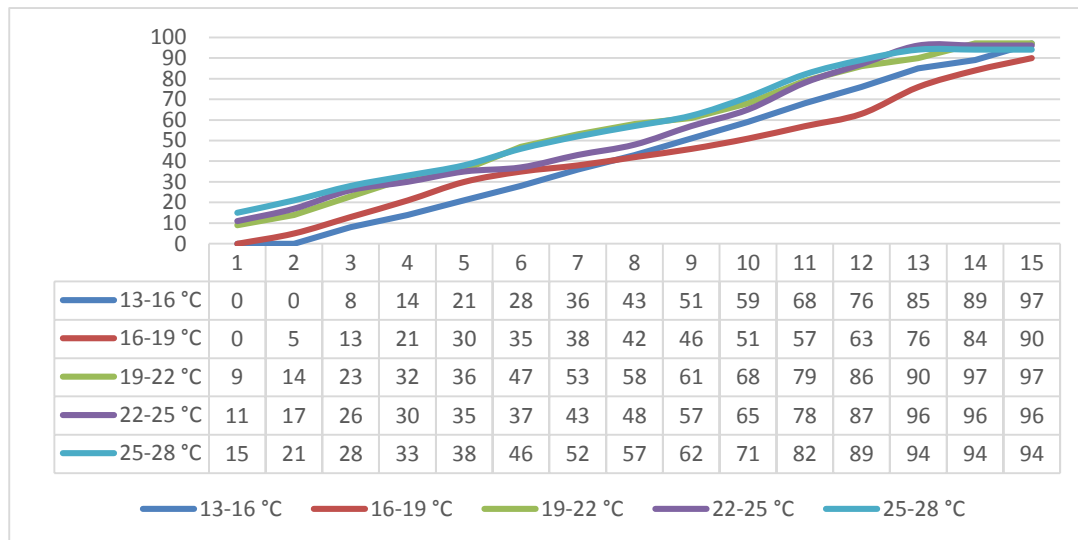
Serological studies were carried out in the laboratory by spectrophotometric method. In the first stage, the dry weight of the plant was calculated. For this, the seeds are dried at 80 C for 72 hours. Then, the weight of the seeds was calculated with a Baoshi brand electronic scale. The dry weight of the Sabza variety was 0.381 grams, and the dry weight of the Karatal'skiy variety was 0.392 grams. The larger the volume of the seeds, the more water they lose, and thus, the amount of water in the "Sabza" variety was 0.015 ml, and in the Karatal'skiy variety, it was 0.02 ml.

Then, the seed varieties were measured with a Polish refractometer, Nr 13519, with birex units. The amount of dry matter was 6 percent in the Sabza variety and 8 percent in the Karatal'skiy variety.

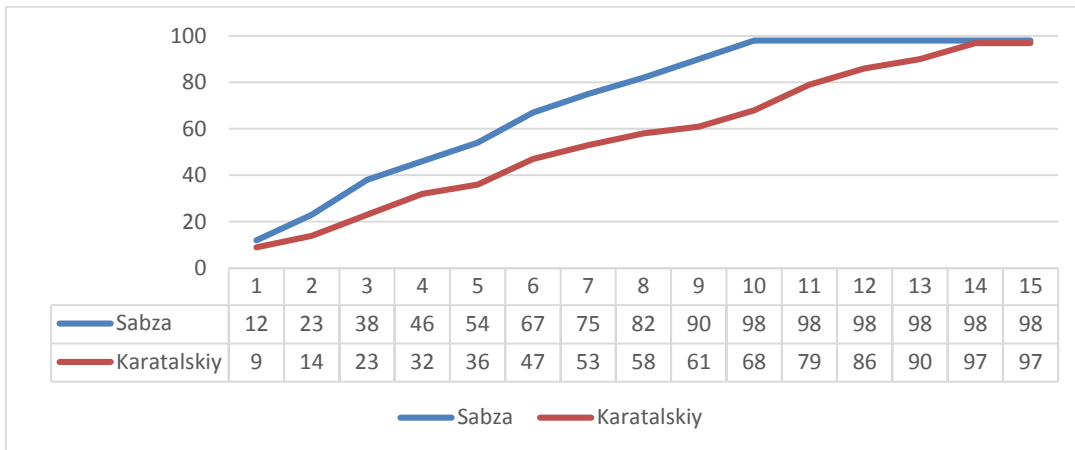
In addition, the seedlings were analyzed microscopically. The size of the cells was observed to be long and numerous in the Karatal'skiy variety. The ratio of the length and width of the cells in the Sabza variety was 35/10  $\mu\text{m}$  on average, and in the Karatal'skiy variety, this ratio was observed to be 40/20  $\mu\text{m}$ . The analysis was carried out with a Carl Zeiss Axiolmager 2 microscope (Figure 4).



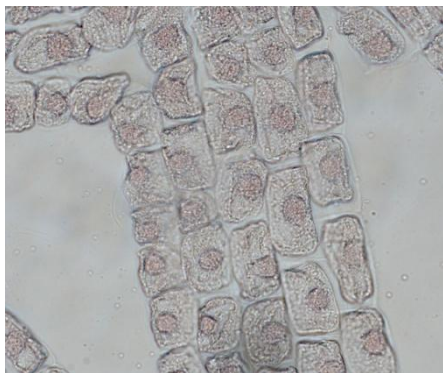
**Chart 1.** The germination percentage of the "Sabza" variety in 15 days



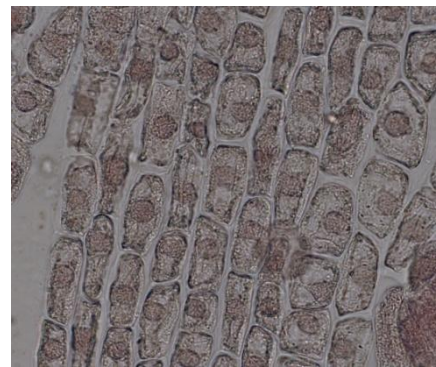
**Chart 2.** The germination percentage of the "Karatskiy" variety in 15 days



**Chart 3.** Comparison of germination percentage of Karatalsky and Sabza varieties at the most optimal temperature (19-22 C)

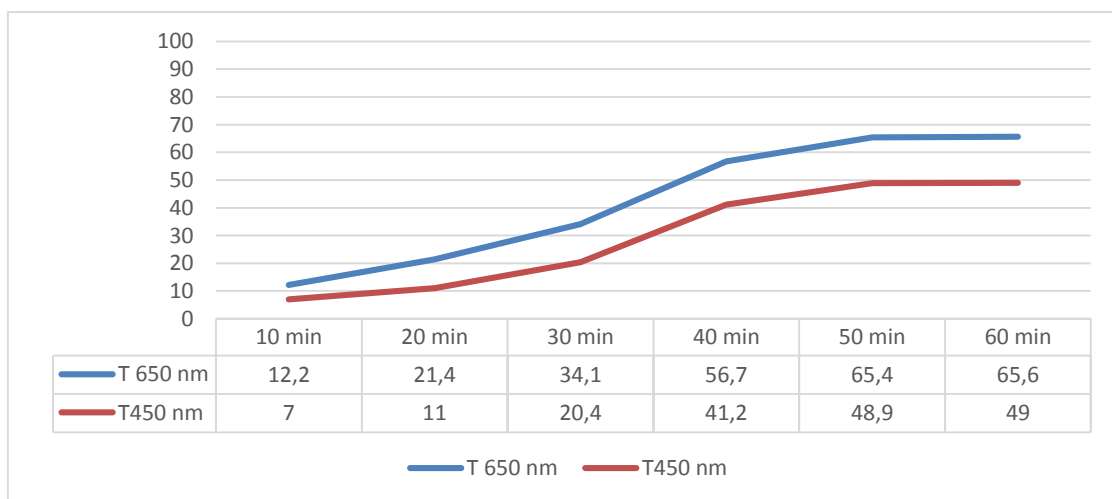


A-Sabza

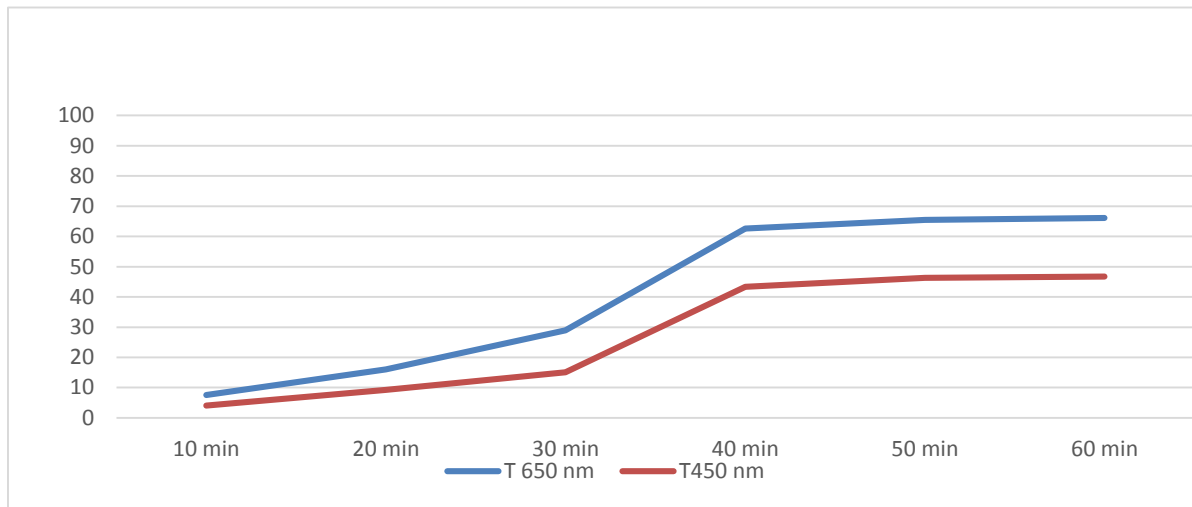


B-Karatalskiy

**Figure 4.** Microscopic view of germinated seeds



**Chart 4.** The result of the transmission of light waves as a result of spectrometric analyzes in the "Sabza" variety



**Chart 5.** The result of the transmission of light waves as a result of spectrometric analyzes in the "Karatal'skiy" variety

The germinated parts of the seed were cut and crushed by adding 10 ml of water to 1 gram of germinated tissue, and centrifuged in the OHAUS brand FC5816R centrifuge. In the obtained substance, two phases were obtained, the phase giving sediment and the phase soluble in water. The phase insoluble residues giving the residue are dry matter. The water-soluble phase is water-soluble substances. These include vitamins, some minerals, etc. 2-3 percent of the colloids were taken on the substance. As a result of the RPM 350 Watt, 3000 cycles centrifugation, the following results were obtained.

### 3. Discussion

In the initial phase of our research, we used the extensive capabilities of the microscope to microscopically analysis dry seeds of both cultivars. The reason for this was to identify the differences between the seeds, and these differences are very clearly visible. Microscopic analysis of the soaked seed to assess the quality of the seed coat also showed that the seeds of the Karatal'skiy variety had a thicker seed coat than the seed. It was observed that the shell of "Karatal'skiy" seed was less affected by water than that of "Sabza" variety. Determining the dry weight, volume and density of the seeds also helped us to obtain other information. Thus, when determining the dry form of the seeds, we also obtained information about the amount of water in its content. we obtained and observed that the seeds of the "Karatal'skiy" variety have a heavier weight and contain less water, which suggests that the fruits of the "Sabza" variety are juicier. in addition to determining the most optimal temperature, we also fundamentally studied the percentage of seed germination. As a result of the spectrophotometric analysis, we can say that the amount of dry residue of the "Karatal'skiy" variety is more than the seeds, and the ability to transmit light is favorable. In addition, our microscopic analysis of the seedlings shows that the "Karatal'skiy" variety has a denser cell structure and cell sizes. longer and wider. All this information is very important in the comparative study of both species.

#### 4. Conclusion

In the paper is shown that compared to the "Sabza" variety, the microscopic structure of the "Karatal'skiy" variety is denser, the water capacity is lower, the germination process is slower, it is resistant to cold, and the fruit is less juicy. The microscopic analysis of the seeds gives a reason to make certain predictions about the morphological structure of the fruit in the future. The results of the spectrophotometric analysis show that the light transmittance is higher in the variety with a higher amount of dry residue.

The results of determining the percentage of seed germination show that it is more appropriate to plant the "Karatal'skiy" variety in zones with low annual temperature norms. Compared to the "Karatal'skiy" variety, the microscopic structure of the "Sabza" variety is sparser, the water content is high, the fruit is juicy, and the annual temperature of the "Sabza" variety is lower. Planting in areas with relatively high rates can give more essential results.

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