DOI: https://doi.org/10.53040/cga12.25 UDC: 635.646:631.53.02

STORAGE POTENTIAL OF THE EGGPLANT (*SOLANUM MELONGENA* L.) COLLECTION ACCESSIONS FOR *EX SITU* CONSERVATION IN A PLANT GENE BANK

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Abstract. *To determine the storage potential (SP) of samples from the eggplant collection in the gene bank's active collections, two tests were used: the accelerated seed aging test (AA) and the electrical conductivity test (EC). After conducting the AA test to the seeds, which was conducted at an elevated air temperature (45-47°C) and elevated humidity (90-100%), the morphophysiological and biochemical parameters of the seeds and seedlings were determined. Based on the set of parameters studied, the eggplant samples were divided into two groups: Group 1 - with high seed viability (genotypes Sucleischii, Varatic, Rada, Almaz, Acvamarin, Laura), Group 2 - with average seed viability (Magda, Belaia Lilia, Flower Goddess, Black Beauty genotypes). Determining the storage potential of seeds enables us to predict the storage life of eggplant collection samples in a plant gene bank during ex situ conservation, as well as to make recommendations on seed reproduction times.*

Keywords: gene bank, eggplant, germination, germination, root length, root biomass, peroxidase accelerated aging, active collections, longevity, ex situ conservation, storage potential.

INTRODUCTION

One of the main tasks of plant genetic banks in the *ex situ* conservation of germplasm is to preserve the viability of seed material. This is because complex aging processes occur in seeds, leading to a gradual loss of viability and genetic uniformity [1, 2, 3]. The deterioration of the physiological quality of seeds contributes to impaired plant growth and development, as well as reduced resistance to abiotic and biotic stresses. Therefore, it is necessary to assess the SP of collection samples before they are placed in long-term storage. This comprehensive indicator is widely used in various gene banks around the world, as it enables conclusions to be drawn about the longevity of samples under *ex situ* conservation conditions, as well as enabling them to be graded according to storage potential [1, 4, 5, 6]. To determine seed viability, an accelerated seed aging test is performed under

conditions of elevated temperature and humidity for a short period of time [7]. Following the test, seed viability can be characterized by various morphophysiological and biochemical parameters, enabling differences between collection samples to be assessed [8, 9]. This test enables the identification of samples that are not suitable for long-term storage in a plant gene bank, the provision of recommendations on reproduction times for seeds, and the indication of the need to restore the viability of valuable collection samples.

The aim of this study was to determine the viability of eggplant collection samples prior to their placement in long-term storage in a plant gene bank.

MATERIALS AND METHODS

The objects of the study were collection samples of eggplant from active collections of the plant genetic bank. Ten samples were tested: *Sucleischii*, *Varatic*, *Rada*, *Almaz*, *Acvamarin*, *Laura*, *Magda*, *Belaia Lilia*, *Flower Goddess*, and *Black Beauty*. To determine the germination capacity of eggplant seeds, we used the accelerated seed aging test according to the Hampton, Tekrony method [7] and the seed electrical conductivity (EC) test [4], which are included in the International Seed Testing Association [10]. According to international standards, the seed aging test for eggplant seeds should be conducted at an air temperature of 42°C, air humidity of 90-100%, and an aging period of 72 hours. However, when testing these samples, it was found that the above temperature does not allow the seeds to age. Therefore, we proposed new temperature conditions (45-47°C), which helped to achieve the desired effect. Following the test, the morphophysiological parameters of seeds and seedlings were determined: germination energy (GE) and germination (G) of seeds, root length (RL), wet (WB) and dry (DB) biomass of roots [10], electrical conductivity of solutions [4], and peroxidase enzyme activity [11]. Normal seeds were used as controls. The data were processed using the *Statistica 7* software package.

REZULTS AND DISCUSSIONS

After conducting the AA test on eggplant seeds, a decrease in GE and G of seeds was observed. The decrease in these parameters in different genotypes

compared to the control was 13.0-32.5% and 11.0-33.0%, respectively, which indicates their genetic specificity. Based on changes in EP, the genotypes were

divided into two groups: Group 1: *Almaz*, *Acvamarin*, *Belaia Lilia*, *Black Beauty*, *Magda*, *Flower Goddess* (EP decrease of 9.5-18.0%); Group 2: *Sucleischii*, *Varatic*, *Rada*, *Laura* (EP decrease of 19.0-32.5%). Based on seed germination, the genotypes were also divided into two groups: Group 1: *Sucleischii*, *Varatic*, *Rada*,

Almaz, *Acvamarin*, *Laura* (decrease in the parameter by 11.0-18.0%) (Fig. 1). Group 2: *Magda*, *Belaia Lilia*, *Flower Goddess*, *Black Beauty* (decrease by 20.0-33.0 %) (Fig. 2). After the treatment of eggplant seeds, a decrease in other morphophysiological parameters was also observed.

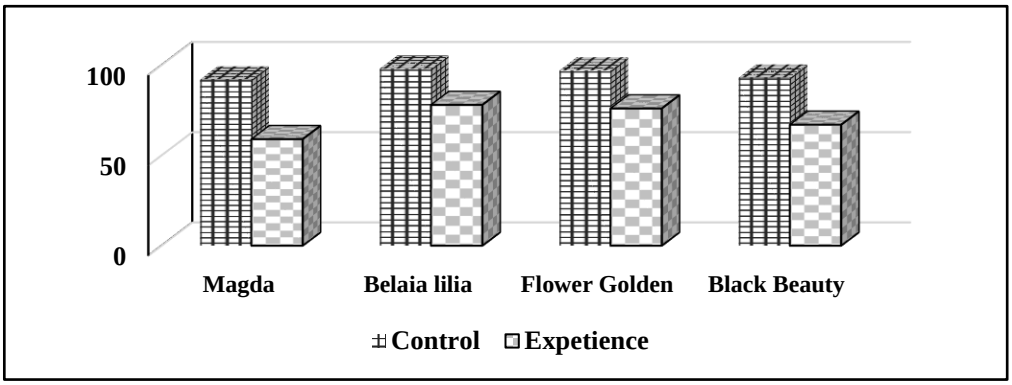


Figure 1. Germination of eggplant seeds following the action of the accelerated seed aging test, % (1st group)

The diameter of the seeds after treatment decreased by an average of 1.5-5.0 mm compared to the control, depending on the genotype (Fig. 3). The strongest inhibition of seedling root growth was observed in the genotypes *Varatic*, *Almaz*, *Belaia Lilia*, *Black Beauty*, *Flower Goddess*, and the weakest in the genotypes *Acvamarin* and *Laura*.

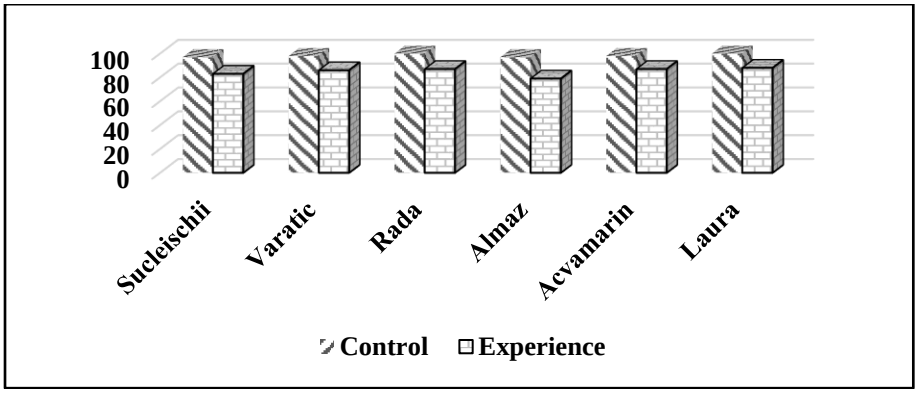


Figure 2. Germination of eggplant seeds following the action of the accelerated seed aging test, % (2nd group)

Determination of the wet and dry biomass of seedlings after seed treatment revealed

a similar pattern. The raw biomass of the roots decreased compared to the control by an average of 17.5-61.0 mg depending on the genotype, with the maximum decrease in this parameter observed in the genotypes *Varatic*, *Almaz*, and *Black Beauty*. A sharp drop in morphophysiological parameters in certain genotypes after seed ST testing indicates their lower resistance to high temperature and humidity. Almost all eggplant collection samples showed a significant positive correlation between seed germination and germination energy (r=+0.59), root length (r=+0.62), wet (=+0.64) and dry (r=+0.53) biomass.

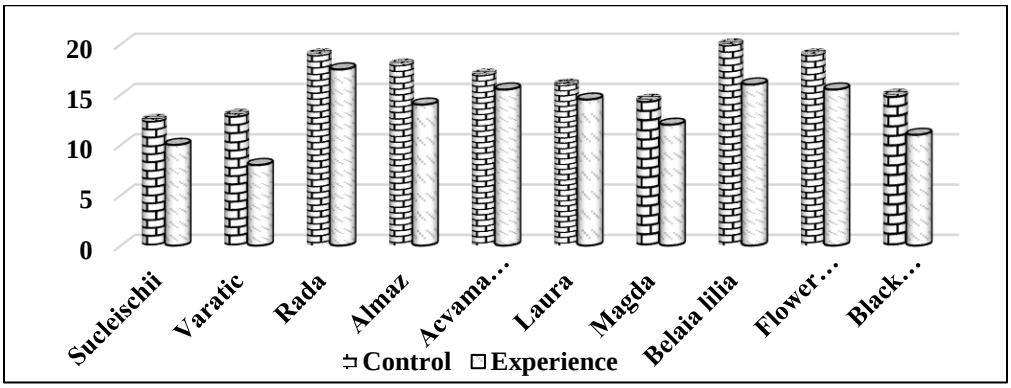


Figure 3. Variability of root length of eggplant seedlings after accelerated seed aging, mm

The electrolyte yield from seeds was also determined by the electrical conductivity of solutions with normal and aged seeds at two swelling exposures: 24 and 48 hours. At 48 hours of exposure, the difference between genotypes became more pronounced. After accelerated seed aging test the electrical conductivity of the solutions increased on average by 1.1-1.5 times compared to the control, depending on the genotype (Table 1). The greatest increase in electrical conductivity was observed in the genotypes *Varatic*, *Belaia Lilia*, and *Black Beauty*, and the smallest in the genotypes Sucleischii, *Almaz*, and *Laura*. A slight increase in electrolyte yield indicates a small increase in protoplasm permeability after accelerated seed aging.

This fact is favorable for the successful *ex situ* conservation of samples. The content of the peroxidase enzyme in the roots of seedlings increased after accelerated seed aging compared to the control by 1.3-2.5 times, depending on the genotype, which is characteristic of the effect of thermal stress on seeds (Table 2).

Table 1. Electrical conductivity of eggplant seed solutions following the accelerated seed aging test, mS/m^2

Order No.	Genotype	Control	Experience
1	*Sucleischii*	1,50 ± 0,15	1,72 ± 0,13
2	*Varatic*	0,85 ± 0,11	1,29 ± 0,17
3	*Rada*	0,69 ± 0,12	0,90 ± 0,09
4	*Almaz*	3,35 ± 0,11	3,55 ± 0,14
5	*Acvamarin*	2,85 ± 0,12	3,45 ±0,11*
6	*Laura*	3,52 ± 0,07	3,85 ± 0,10
7	*Magda*	3,30 ± 0,14	3,75 ± 0,15
8	*Belaia Lilia*	0,75 ± 0,09	1,10 ± 0,07*
9	*Flower Golden*	3,65 ± 0,15	4,10 ± 0,12*
10	*Black Beauty*	2,75 ± 0,11	3,65 ± 0,13*

**- the difference is significant at p<0.05*

The greatest increase in enzyme activity in the radicles of seedlings after accelerated seed aging was observed in the genotypes *Sucleischii*, *Almaz*, and *Magda* (2.2; 2.2 and 2.5 times, respectively), and the smallest increase was observed in the genotypes *Acvamarin*, *Belaia Lilia*, *Flower Goddess* (1.3; 1.5 and 1.5 times, respectively).

Table 2. Peroxidase activity in the roots of eggplant sprouts following the accelerated seed aging test, conventional units

Order No.	Genotype	Control	Experience
1	*Sucleischii*	0,19 ± 0,02	0,42 ± 0,03*
2	*Varatic*	0,27 ± 0,02	0,44 ± 0,02*
3	*Rada*	0,19 ± 0,01	0,37 ± 0,02*
4	*Almaz*	0,20 ± 0,02	0,44 ± 0,03*
5	*Acvamarin*	0,27 ± 0,02	0,34 ±0,03
6	*Laura*	0,30 ± 0,03	0,60 ± 0,04*
7	*Magda*	0,20 ± 0,03	0,49 ± 0,03*
8	*Belaia Lilia*	0,28 ± 0,03	0,42 ± 0,04*
9	*Flower Golden*	0,31 ± 0,03	0,45 ± 0,04*
10	*Black Beauty*	0,29 ± 0,03	0,55 ± 0,04*

**- the difference is significant at p<0.05*

Based on the combination of morphophysiological and biochemical parameters of eggplant seeds and seedlings, the following genotypes had the highest storage potential: *Sucleischii*, *Varatic*, *Rada*, *Almaz*, *Acvamarin*, and *Laura*.

CONCLUSIONS

1. Another air temperature was proposed and tested for the accelerated aging of eggplant seeds: 45-47°C.

2. Using the accelerated seed aging test on eggplant seeds and determining their morphophysiological and biochemical parameters made it possible to assess the storage potential of samples from active gene bank collections and grade them accordingly.

3. All of the samples from the eggplant collection studied are suitable for *ex situ* conservation in a plant gene bank.

Acknowledgments: The research was conducted within the framework of Subprogram 011102 "Expansion and conservation of genetic diversity, improvement of crop gene pool under climate change conditions", financed by the Ministry of Education and Science.

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