ASPECTS REGARDING THE BEHAVIOR OF SOME SPECIES FROM THE *SOLANACEAE* FAMILY TO THE ULTRASOUND TREATMENT

ASPECTE PRIVIND COMPORTAREA UNOR SPECII DIN FAMILIA *SOLANACEAE* LA TRATAMENTUL CU ULTRASUNETE

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Abstract. *The paper presents the results of a study referring to the behavior of the Lycopersicon esculentum Mill. (Kristin variety) and Solanum melongena L. (Daniela variety) species to the ultrasound treatment. The results obtained emphasize specific values of the analyzed indicators (the percentage of germinated seeds, the water and dry substance content of the seedling, fresh weight of the seedling, the length of vegetative organs of the seedling) according to the species and the experimental conditions. In both analyzed species, the percentage of germinated seeds progressively increases during the analyzed period; the germination is epigeous. At the end of the experiment (at 22 day) on constate: a high degree of hydration of the seedlings in all the experimental variants; high values of the length of vegetative organs at variants with a short exposure time of ultrasounds.*

Key words: *Lycopersicon esculentum* Mill., *Solanum melongena* L., morphometric and physiological indicators, ultrasounds.

Rezumat. *În lucrare se prezintă rezultatele unui studiu referitor la comportarea speciilor Lycopersicon esculentum Mill., soiul Kristin şi Solanum melongena L., soiul Daniela, la tratamentul cu ultrasunete. Rezultatele obţinute evidenţiază variaţii valorice specifice ale indicatorilor analizaţi (procentajul seminţelor germinate, conţinutul de apă şi de substanţă uscată a plantulelor, greutatea proaspătă şi lungimea organelor vegetative ale plantulelor) funcţie de specie şi de condiţiile experimentale. La ambele specii analizate, procentajul seminţelor germinate creşte progresiv pe parcursul perioadei analizate; germinaţia este epigee. La finalul experimentului (la 22 zile) se constată: un grad mare de hidratare a plantulelor la toate variantele experimentale; valori ridicate ale lungimii organelor vegetative la variantele cu timp de expunere mic la ultrasunete.*

Cuvinte cheie: *Lycopersicon esculentum* Mill., *Solanum melongena* L., indicatori morfometrici şi fiziologici, ultrasunete.

INTRODUCTION

Ultrasounds differentiate from the sounds through their high frequency (over 16 kHz) and the enormous quantity of energy that they effuse in the propagation media. For these reasons, they have a large utility, being used in

physics, chemistry, biology, medicine, agriculture, industry etc. (Dimitriu Elena, Nicolau P., Teodoru V., 1990) .

The researches carried out by a series of authors (Albu E., Auslander D., Veress Eva, 1969; Albu Elena, Veress Eva, Auslander D., 1968; Albu Elena, Auslander D., Fodor M., Veress Eva,1968; Dăbală I., Auslander D.,1970; Dimitriu Elena, Nicolau P., Teodoru V., 1990) have emphasized the stimulating effect of ultrasounds on the germination, growth and development of plants and on the vegetal production as well. Albu and collab. (1968) have discovered the fact that the ultrasonic irradiation of tomato seeds, Seelandia variety favorably influence the germinative faculty and energy, the growth and development of plants, the production and increases the resistance of plants to the attack of cryptogenic diseases. In addition, the experiences carried out by us with the seeds of *Pastinaca sativa* and S*pinacia oleracea* have emphasized a stimulating effect of ultrasounds on the respiration intensity and the activity of some oxidoreductases (Stratu Anişoara, Olteanu Zenovia, Peptanariu M., Zamfirache Maria – Magdalena, 2005; Stratu Anişoara, Olteanu Zenovia, Peptanariu M., Murariu Alexandrina, 2009).

Based on these considerations, we proposed to test the effect of the ultrasound treatment on the tomatoes (*Lycopersicom esculentum* Mill.) and eggplants (S*olanum melongena* L.) seeds.

MATERIALS AND METHODS

As a biological material, we used seeds of tomatoes (Kristin variety) and eggplants (Daniela variety) extracted from the crop of 2008, acquired from S. C. Unisem Iaşi. The Kristin variety is semi-early, recommended for industrialization and consume in fresh state. It distinguishes itself through a great capacity of production, the strong red color of fruit and the high content of dry substance (www.recolta.eu/).

Daniela variety is semi-early, recommended for the harvest in the field and in the solar. They have vigorous plants, with high waist and present a productive potential of 38-43 t/ha (www.gazetadeagricultura.info).

The seeds of the two species were subjected to the action of an ultrasonic field, with the frequency of 48 and 36 kHz, electrical power of 60 and 30 V.A., at time intervals of 1, 2, 4 minutes. For ultrasounding the seeds we used two ultrasound beats which distinguish themselves through the frequency and electrical power properties. After the ultrasounding, the seeds were inserted into water for drenching, for 24 hours in laboratory conditions. Afterwards, the seeds were placed in pots with soil that present the following characteristics: pH comprised between 5.5 – 6.5; water content of 60 - 70 %, azote - 410 ppm, phosphorus – 192 ppm, potassium 1350 ppm. For each variant, we used 20 seeds. For each tested species we achieved five experimental variants: a control variant and four treatment variants – where the seeds were tested with ultrasounds (table 1).

We analyzed the following indicators : the percentage of germinated seeds (we considered it equivalent with the percentage of seedlings emergence); the water and dry substance content of seedlings (Boldor O., Trifu N., Raianu O. 1981), the fresh mass and the length of vegetative organs of seedlings at 22 days since the experiment beginning.

Table 1

The experimental variants

Experimental variants	Exposal time (minute)	Acoustic parameters	
		Frequency (kHz)	Electric power (W)
M		-	-
V1	1	48	60
V2	2	48	60
V3	2	36	30
V4	4	36	30

RESULTS AND DISCUSSIONS

The results obtained emphasize specific value variations of the analyzed indicators according to the species and the experimental conditions.

The germination of seeds. We notice the fact that the tomatoes seeds germinates easier in comparison with the eggplants ones. In both analyzed species, the germination is epigeous.

In tomatoes, four days after the experiments startup, the percentage of germinated seeds has values comprised between 50% - 80 % for the treatment variants and 90% for the control. Starting the 5th day for the variants V2, V3, V4, respectively the 6th for the variant V1 the percentage of germinated seeds remains constant until the end of the experiment. The maximum percentage (100%) is obtained at the V2 variant and the minimum one (60%) in the V1 variant (figure 1).

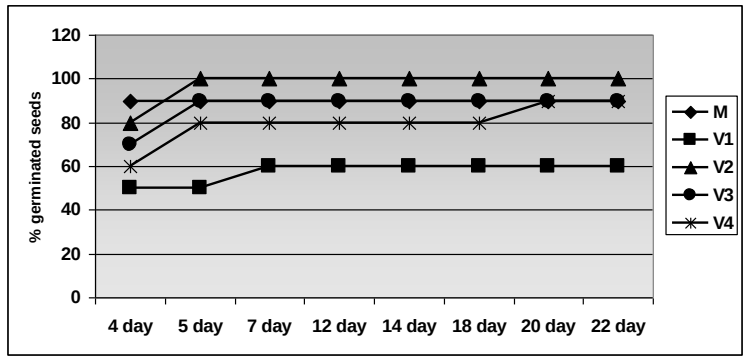

Fig.1. The percentaje of germinated seeds at tomatoes

In eggplants, 9 days since the experiment beginning, the percentage of seedlings emerged varies between 20 % (M, V1, V4) and 40 % (V2) (figure 2).

During the analyzed period, in all the experimental variants, the percentage of emerged seedlings progressively increased until the 18th day after which it remains at constant values until the end of the experiment, the maximum percentage is obtained in the V2 variant (90%) and the minimum one (50%) in the V4 variant. In comparison with the tomatoes, the eggplants have a lower germination percentage (80%).

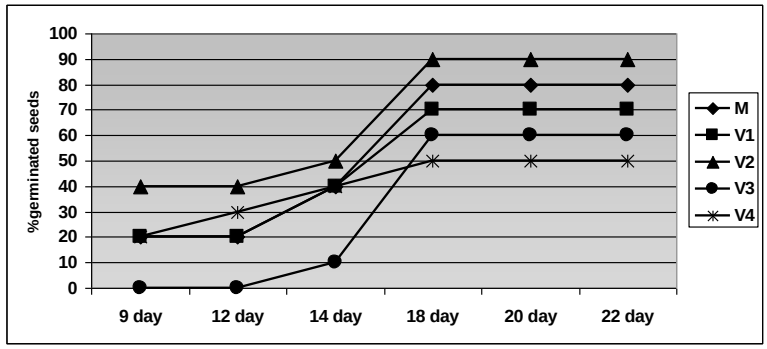

Fig. 2. The percentaje of germinated seeds at eggplants

The **water content** varies between 95.02 g % and 95.13 g % in tomatoes and 96.13 g % and 97 g % in eggplants. We discover very small value variations between the control and the treatment variants. We notice the fact that the seedlings have a higher degree of hydration at 22 days after the experiment startup (figure 3). The dry substance content has low values, comprised between 4.87 g % and 4.98 g% in tomatoes and between 3.0 g % and 3.87 g % in eggplants.

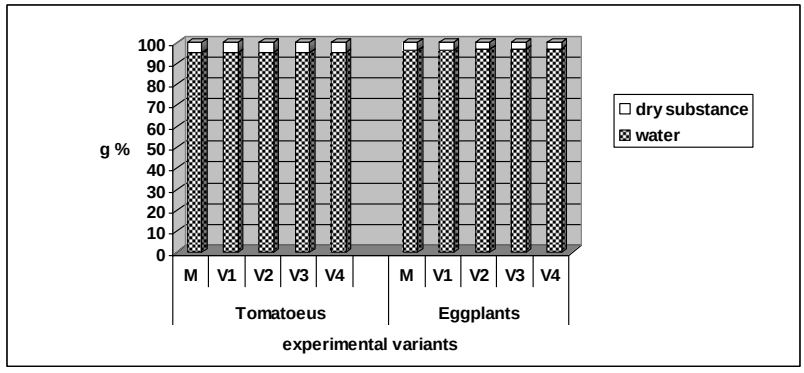

Fig. 3. The water and dry substance content of seedlings at tomatoes / eggplants

The seedlings from the two test species are distinguished through some morphological and morphometric characteristics. In tomatoes the surface of aerial organs is covered with hairs, the leaves are odd-pinnate. The root is pivoting. The epicotyl is developed. In the control the length of seedlings /of vegetative organs and the fresh mass of seedlings, have intermediary values compared to those registered in the control variants. The length of the hypocotyl is bigger than the roots (figure 4; 5).

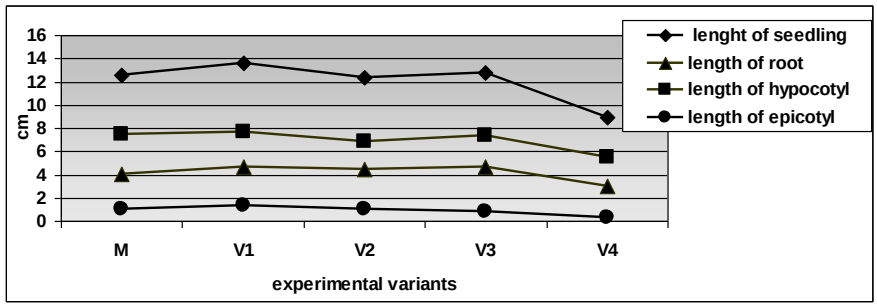

Fig. 4. The length of vegetative organs of seedlings at tomatoes

In eggplants, the seedlings are hairy, the leaves are ovate-lanceolate. The epicotyl is little developed. The root is pivoting. The average length of the hypocotyl is smaller than the one of the root with the exception of the variant V4 (figure 5, 6). We notice the fact that the ultrasound treatment with the frequency of 48 kHz, exposal time of 1 minute and 36 kHz, exposal time 2 minutes has a tendency of stimulating the seedlings growth in both analyzed species.

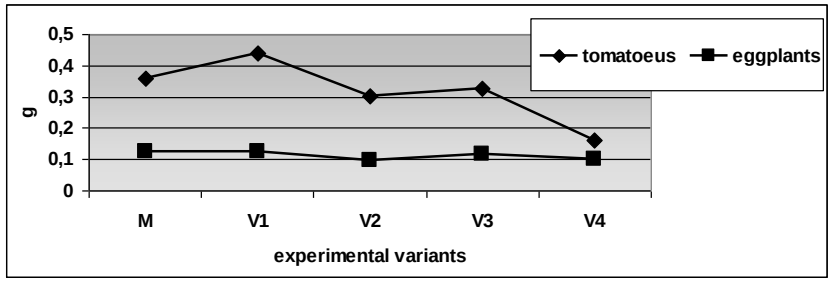

Fig. 5. The fresh mass of seedlings at tomatoes / eggplants

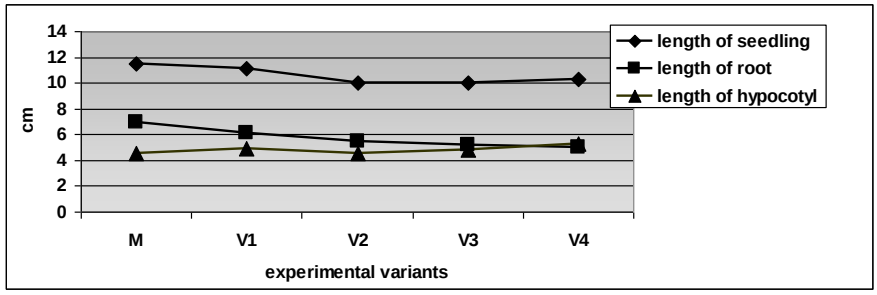

Fig. 6. The length of vegetative organs of seedlings at eggplants

CONCLUSIONS

The ultrasounds with the frequency of 48 kHz, exposal time 2 minutes, stimulate germination of seeds in both analyzed species. The short-time exposal to ultrasounds favorably influences the growth of seedlings in the two test species.

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