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RESEARCH ON THE EFFECT OF VERMICOMPOST FERTILIZATION ON EGGPLANTS SEEDLINGS (*SOLANUM MELONGENA* L.)

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Abstract

Although worldwide, the use of vermicomposts in horticulture is a well-known technique, in Romania, this is at pioneering level. Therefore, the present study presents the results of an experiment that aimed at determining the influence of the application of vermicompost in the substrate in different proportions and the foliar application in different concentrations of the vermicompost filtered macerate on the seedlings of eggplants (Solanum melongena L.). The analysis of the results revealed that, compared to the blank variant, to which no vermicompost was applied, all the other variants have recorded superior results in the growth and development of seedlings. The best results were obtained in substrate fertilizer variants, 20% and 10%. Favorable results were also recorded in the variant where the vermicompost was applied foliar as filtered macerate at a concentration of 30%.

Key words*: Solanum melongena L, vermicompost, growth, eggplants.*

INTRODUCTION

The massive use of chemical fertilizers in horticulture has already produced negative effects on the quality of production, the environment and human health over the last three decades, with the concept of sustainability becoming a key issue for the future (Lichtfouse et al., 2009). Lately, amid the development of concepts such as integrated and biological horticulture, it has been necessary to reconsider the fertilizers used in horticultural practice. An alternative may be the use of vermicomposts, which, compared to conventional composts, are the product of accelerated biooxidation of organic matter by the use of high densities of earthworms without the thermophilic phase (Dominiguez et al., 1997).

Vermicompost is rich in nutrients, easily soluble in plants (Chaoui et al., 2003). It also contains growth hormones, enzymes and beneficial microorganisms and does not contain pathogens and toxic chemicals (Canellas et al., 2002). The use of vermicomposts leads to the stimulation of plant immunity. Edwards et al. (2004) established that the vermicompost has reduced some fungal diseases such as *Phytium* in cucumbers, *Rhizoctonia* in radishes, *Verticillium* in strawberries and *Phomoposis* and *Sphaerotheca fulginea* in field grapes.

Several studies have evaluated the impact of the application of vermicomposts in substrate mixtures for the production of seedlings, in terms of plant growth and development.

The best responses usually occurred when the vermicompost had a relatively small proportion (20-40%), higher amounts of vermicompost, did not always improve plant growth (Atiyeh et al., 2000; Hashemimajd et al., 2004; Prasanna et al., 2010).

Another possibility of using vermicomposts is foliar application, as a filtered macerate (vermicompost tea), which can provide a rich and active and alive bacterial flora, organic acids, growth regulators and mineral nutrients that are soluble in aerial organs of plants (Edwards et al., 2006).

The present experiment aimed at testing the fertilizing action of the vermicompost obtained at VRDS Buzau over the seedlings of the *Solanum melongena* L. eggplants in order to recommend it to the Romanian sapling producers as a fertilizing support of the growth rate and development of the plants, which would lead to a better utilization of organic residues and waste, with implications for reducing the production costs of seedlings and a significant reduction of environmental pollution.

MATERIALS AND METHODS

The experiment was carried out in the spring of 2017 within the vegetable growing sector of the University of Agronomic Sciences and Veterinary Medicine of Bucharest, and it assumes the installation of a monofactorial experimental scheme with the following variants: V1 - unfertilized (100% peat); V2 - seedlings fertilized in the substrate with 10% vermicompost (90% peat); V3 - seedlings fertilized in the substrate with 20% vermicompost (80% peat); V4 - foliar fertilized seedlings with filter macerated vermicompost in 20% concentration and V5 - foliar fertilized seedlings with 30% filtered macerated vermicompost. In order to produce the seedlings were made directly in the box in the production department of the seedlings in the Hortinvest greenhouses on the 14th of February 2017, the boxes being filled with the Klasman TS3 peat. Mass uprising occurred very quickly, 9 days after the date of sowing, February 23, 2017. Sowing was done on March 2nd in 330 cc plastic pot filled with Klasman TS3 ± vermicompost 10% and 20% (V2 and V3) peat, according to the experimental protocol. Care work has been applied uniformly to ensure optimal growth and development conditions, automated, computer-assisted: Temperature T^{o} = 20-28^{o}C; substrate humidity 55-65%; ventilation of the space and maintaining the correct lighting regime.

In order to evaluate the influence of vermicompost on the growth and development of seedlings, observations and measurements were made at one moment only, at the end of the experimentation period, when the seedlings were good for planting, April 10, 2017, the seedlings age being of 52 days.

By direct observations and measurements we determined: plant height (HPA); root length (HR); the number of true formed leaves (NFZ); leaf frequency (NFZ / HPA); collet diameter (collet Ø); mass of aerial vegetative apparatus (MPA); mass (MR); the volume of roots (VR); and the total mass of seedlings (Mtot).

The vermicompost used in the experience was produced at the Vegetable Research-Development Station Buzau, using the system of continuously fed beds. Beds are elongated, in a rick style, with a height of 50 cm. The order of the operations involved first placement of the bed, followed by inoculation with earthworms (*Eisenia foetida*) and then repeatedly covering with thin layers of 10-15 cm of compost.

In time, a stratified stratum is created, with the finished product at the bottom (vermicompost), partially consumed in the middle and fresh topped food.

RESULTS AND DISCUSSIONS

The analysis of the seed growth results is presented in Table 1.

It is highlighted that the plants achieved the best and balanced growth in V3, where all the analyzed indicators recorded the highest values: 6.2 formed leaves; 28.2 cm plant height; 22.8 cm root length and 0.21 leaf frequency, followed closely by V5 and V4 that had balanced growths. At the opposite end, V1, unfertilized, achieved the weakest growth, all the indicators analyzed being lower than the other variants.

Table 1. Growth of eggplant seedlings at the end of the experimentation period

Var.	NFZ	HPA (cm)	HR (cm)	NFZ/HPA (no./cm)
V_1	5.8	22.6	13.6	0.25
V_2	6.0	25.8	18.2	**0.23**
V_3	**6.2**	28.2	**22.8**	0.21
V_4	5.6	25.6	21.8	0.21
V_5	5.8	**29.2**	16.8	0.19

As can be seen from Figures 1 and 2, vermicompost fertilization has influenced at least significantly the height of the aerial part (R^2HPA = 0.639) and the seed growth balance, respectively the leaf frequency (R^2 = 0.9423).

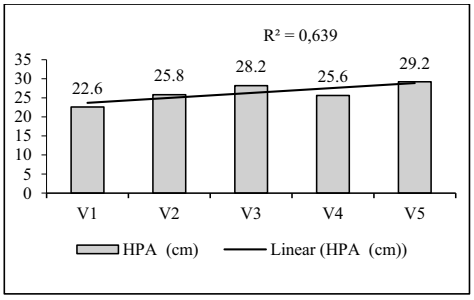

Figure 1. Influence of fertilization with vermicompost on the growth of eggplant

Results on the development of eggplants, evaluated by means of mass, volume and diameter indicators, are presented in Table 2 and Figure 3.

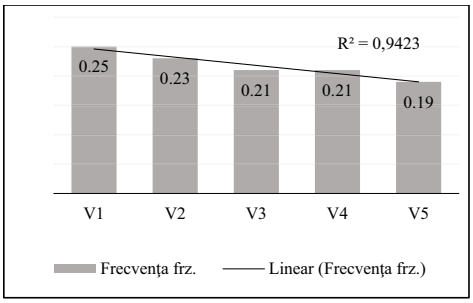

Figure 2. Influence of fertilization with vermicompost on the frequency of leaves in eggplants

Results on the development of eggplants, evaluated by means of mass, volume and diameter indicators, are presented in Table 2 and Figure 3.

Analysis of the results again reveals V3 as the most balanced; In general, the indicators have recorded superior values (10.4 g aerial parts weight, 9.8 cm^3 root volume and 6.2 mm collet diameter), or equal to the other variants: root mass 9.3 g and total mass 19.6 g. This is followed by V2 and V4, variants that have values close to V3 and superior to the other variants. V1 has been shown to be the weakest variant in terms of accumulation compared to other variants.

Table 2. Development of seedlings at the end of the experimentation period

Var.	MPA (g)	MR (g)	Mtot (g)	VR (cm^3)	Ø collet (mm)
V1	7.2	5.2	12.4	5.2	5
V2	8.4	11.8	**20.2**	**9.8**	5
V3	**10.4**	9.2	19.6	**9.8**	**6.2**
V4	7.2	**12.4**	19.6	9	5
V5	9.4	9.2	18.6	9	5.2

From Figure 3 it can be seen that fertilization with vermicompost has a decisive and complex influence on the total mass accumulations of plants ($R^2 = 0.83$).

The indicator showing the weakest differences is the volume of the root system, where for V2 and V3 it recorded 9.8 cm^3, and for V4 and V5 9 cm^3. The other indicators showed much stronger nuances.

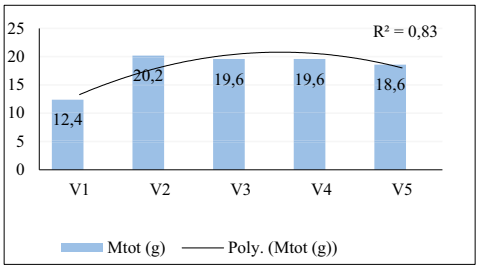

Figure 3. Influence of vermicompost fertilization on the total weight of eggplant seedlings

The indicator showing the weakest difference is the volume of the root system where, for V2 and V3, it recorded 9.8 cm^3 and for V4 and V5 9 cm^3. The other indicators showed much stronger tones, presented and discussed throughout the paper.

Looking at the overall experience, from the point of view of the growth and development of the eggplants, V3 is highlighted, fertilized in substrate with 20% vermicompost, having the best and balanced growth and development of seedlings. Diametrically opposed, the least favourable variant is the unfertilized control variant, which recorded the most unbalanced growth and development of seedlings.

CONCLUSIONS

In carefully analysing the results and interpretations made, we can say that substrate fertilization with 20% vermicompost, determined the obtining of the best seedlings. Very good results in the quality of seedlings have been obtained in the case of V2 and V5. We note that fertilization in the substrate has provided a better growth and development of eggplants seedlings, compared to the foliar application of filtered macerate vermicompost.

As a result of the vermicompost fertilization program of eggplants, their age has decreased from 75 - 80 days (Ciofu et al., 2003; Dobrin 2016), to 52 days, which makes it possible to achieve important economies with the warming of the seedlings production areas, because the sowing can be done almost 1 month later.

Therefore, we recommend to the seedlings producers, using the three fertilization formulas, respectively 20% and 10% vermicompost in the substrate and foliar fertilization with 30% filter maceration vermicompost for the production of eggplants.

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