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THE STUDY OF GERMINATION AND VEGETABLE SEEDLINGS EVOLUTION ON DIFFERENT SUBSTRATES

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Abstract
In order to reduce production costs in vegetable culture are attempting to overcome the financial inputs since to seedlings production. Therefore in this work we aimed to study the behaviour of seed germination and seedling development at the main vegetable species that lends itself to the culture based on seedling production on substrates made from recycled materials / food scraps. Coffee grounds for plants have many benefits. It can be used as fertilizer, insecticide or layer of mulch, mixed with other elements of organic mulch (dry leaves, twigs, dry grass, paper, etc).

Keywords germination, seedlings, vegetable, spent coffee grounds

1. INTRODUCTION

Coffee is one of the most popular and appreciated beverages around the world, being consumed for its stimulating and refreshing properties, which are defined by the green beans composition and changes occurring during the roasting process (Mussatto et al., 2011). As a consequence of this big market, the coffee industry is responsible for generating large quantities of residues; among which, spent coffee grounds are the most significantly generated. Spent coffee grounds are the residual material obtained during the treatment of coffee powder with hot water or steam for the instant coffee preparation. Almost 50 % of the worldwide coffee production is processed for soluble coffee preparation, which generates around 6 million tons of spent coffee grounds per year (Mussatto et al., 2011). Most people just throw out the used grounds, which contributes a significant amount of waste to our ever-increasing landfills. However, used coffee grounds are actually a highly productive ingredient for plants and gardens. The chemical composition of spent coffee grounds is shown in table 1 (Lina et al., 2014).

One distinct advantage of using coffee grounds is that theoretically, they need not be pasteurized because the hot water of the coffee machine has already produced a similar effect (Stamets, 2000; Arora et al., 2012). Using coffee grounds also provides a unique opportunity to reuse urban generated waste. Fan et al. (2000) report a 90% biological efficiency, for used coffee grounds.

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Table 1. The chemical composition of spent coffee grounds

Chemical components	Composition (g/100 g dry material)
Cellulose (Glucose)	12.40±0.79
Hemicellulose	39.10±1.94
Arabinose	3.60±0.52
Mannose	19.07±0.85
Galactose	16.43±1.66
Xylose	not detected
Lignin	23.90±1.70
Insoluble	17.59±1.56
Soluble	6.31±0.37
Fat	2.29±0.30
Ashes	1.30±0.10
Protein	17.44±0.10
Nitrogen	2.79±0.10
Carbon/nitrogen (C/N ratio)	16.91±0.10
Total dietary fiber	60.46±2.19
Insoluble	50.78±1.58
Soluble	9.68±2.70

Results are expressed as mean ± standard deviation; n=3.

2. MATERIALS AND METHODS

Researches on vegetable seedlings were carried out at inside the INCDBH Ştefăneşti phytotron. The research method used was a randomized blocks. It was mounted an experience with 2 factors, 3x3 type, totalling nine experimental variants (Table 2). 10 plants were used for each variant in triplicate, with a total of 270 plants. Experimental factors were:

Factor A- species, 3 graduations:

a1- tomato Argeş 11,

a2- eggplants Pana corbului,

a3- pepper- Payol,

Factor B- culture substrate, 3 graduations:

b1- spent coffee grounds 1/3, peat 2/3,

b2- peat,

b3- top soil 1/3, spent coffee grounds 1/3.

Table 2. Experimental variants

Variants	A – species	B – culture substrate
V.1	a.1	b.1
V.2	a.1	b.2
V.3	a.1	b.3
V.4	a.2	b.1
V.5	a.2	b.2
V.6	a.2	b.3
V.7	a.3	b.1
V.8	a.3	b.2
V.9	a.3	b.3

Seedlings production was done by the principles of sustainable agriculture. The seeds were from own collection and were sown in different substrate at 8.03.2016. The seeds were sown in alveolar trays, one seed/well.

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Figure 1. Sown alveolar trays

It was watered by sprinkling. Germination behaved as the standard. The plants have sprung in 11.03 on tomatoes, 14.03 on eggplants and 20.03 for de pepper. Up to planting the seedlings were properly cared.

Figure 2. Tomato seedlings

Figure 3. Eggplants seedlings

Planting was carried out in cold greenhouse and in field at 10.05.

Figure 4. Cold greenhouse tomato culture

Figure 5. Field tomato culture

3. RESULTS AND DISCUSSIONS

In this experience were made observation and measurements in terms of seed germination and plant growing.

We determined the percentage of emerged plants.

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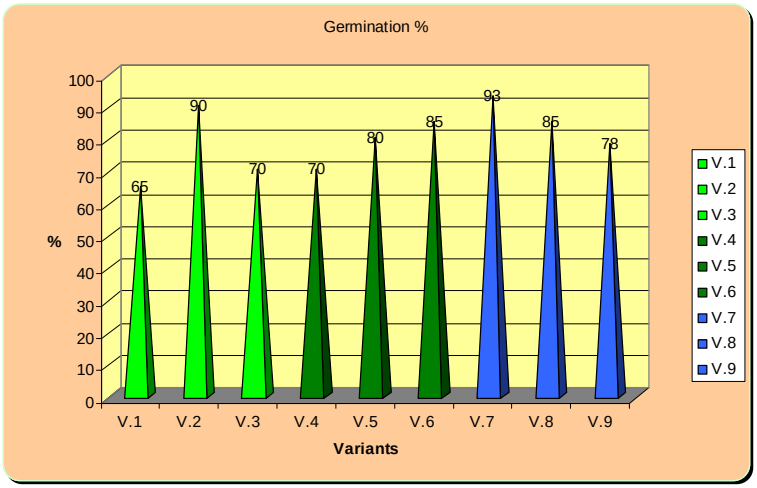

Figure 7. Seed germination

In Figure 6 is observed that tomatoes have sprung best on the substrate consisting only of peat, the eggplants in the one made of top soil 1/3, peat 1/3, spent coffee grounds 1/3 and peppers the one made of spent coffee grounds 1/3, peat 2/3.
In Table 3 we can see that same results were recorded on the increase in plant height, both at 30 days after emergence, and planting.

Table 3. Seedling height (cm)

Variants	Height at 30 days after emergence (cm)	Seedling height at planting (cm)
V.1	7	18
V.2	9	20
V.3	6	15
V.4	5	13
V.5	6	15
V.6	8	18
V.7	10	20
V.8	7	16
V.9	9	18

4. CONCLUSIONS

Each species germinated and grew better on different type of substrate.
Substrate made of top soil, peat and spent coffee grounds determined obtaining the best results on eggplant seedlings.
The best results at the use of peat mixture with spent coffee grounds were registered at peppers.
To produce seedlings in an economic manner we can use without problems spent coffee grounds.

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