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THE EFFECTIVENESS OF THE USE OF PEAT ASH IN THE COMPOSITION OF PEAT NUTRIENT SOIL FOR GROWING TOMATO SEEDLINGS

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Abstract

The article presents the results of studies on the use of nutritious soils based on peat and peat ash for the cultivation of tomato seedlings (Solanum lycopersicum L.). It was found that the most effective was the use of peat-ash compost with a ratio of components 1:4 and peat-ash-lupine compost (1:1:2). The results obtained confirmed their positive influence on the biomass growth of tomato plants, foliage and stem length.

Key words: *nutrient peat soil, peat ash, peat-ash composts, Solanum lycopersicum L., tomato seedlings*

INTRODUCTION

When growing seedlings of vegetable crops it is important the correct selection of soil and nutrient components for their production.
Practice has shown that to effectively solve problems, improve nutritional regime of soil substrates, diseases of vegetable crops with the use of chemicals is not possible [2].
Agricultural producers around the world face the problem of yield losses due to the accumulation of infection in soil and soils that leads to strong yield losses, which may lead to yield losses and reduced quality of commercial products [1, 5].
Numerous experiments and practice shows that every hundredweight conventional ash in its rational use can give an additional, depending on the culture, under which it is applied to 1 kg of grain, more than 4-5 kg of hay, 4 to 5 kg of potatoes or vegetables, etc.
All types of ash contain in its composition a significant amount of various grounds that determines their alkaline properties. The total neutralizing capacity of wood ash in the calculation of the calcium carbonate is 50-60 % of the weight of ash, peat - 20-30%, i.e. for every hundredweight of wood ash applied to soils, can replace of 0.5-0.6 kg carbonate of lime, peat ash – 0.2-0.3 C, respectively.
Ash is a good neutralizing agent and may be used instead of conventional calcium fertilizers. All species of ash in its composition are valuable fertilizers that contain, along with potassium, phosphorus and calcium, a considerable amount of useful plant nutrient substance and trace elements that play an important role in the life of plants [7, 8].
Peat ash is a product of the combustion of peat (power plants, boilers, etc.), mainly intended for liming (neutralization) of acidic soils.
When composting with peat ash neutralizes the acidity of the peat and enriches its mineral nutrients. Peat ash can also be used to obtain torfosol-Lupin compost, the advantage of which is that in them the nitrogen of peat organic matter, potassium and phosphorus pass into the ash available to plants [3, 7].
However peat-ash compost and peat-ash-lupin compost earlier widely used to fertilize field crops, and details their use in low-volume culture very little.
In this context, the purpose of the research is to develop recipes nutritious soils based on peat for growing seedlings of vegetable crops in smallholdings.

MATERIALS AND METHODS

The objectives of the research were: the determination of the efficiency of the

application of microbiological fertilizer nutrient soils based on peat; the formulation of peat and ash nourishing the soil for growing tomato seedlings; the formulation of peat-lupin-ash nourishing the soil for growing tomato seedlings.

In vegetation experiments conducted by the division of production and use of organic fertilizers and peat VNIIOU in 2012-2013, it was used soil nutrient, which is peat-ash compost (PAC) and peat-ash-lupin compost (PALC), obtained by passive composting for 8 months.

The study was carried out in conditions of film greenhouses.

The basis of soil nutrients was the peat – this option was adopted as a control. The study was performed according to the following scheme:

1. Peat control
2. Peat + ash (PAC) (1:1)
3. Peat + ash (1: 2)
4. Peat + ash (1: 3)
5. Peat + ash (1: 4)
6. Peat + ash + green mass of lupine (PALC) (1:1:1)
7. Peat + ash + green mass of lupine (2:1:1)
8. Peat + ash green + mass of lupine (1:1:2)
9. Peat+ ash + green mass of lupine (1:2:1)

In soil there were planted seedlings of Dubok tomato varieties. Corporotomy filled cell plastic cassettes designed for growing seedlings. The volume of one cell is 25 cm^3. The seedlings of tomato were planted in the cells one by one. Each variant was grown at 64 plants. The options laid in 4-fold repetition.

The determination of the total neutralizing capacity of peat ash in terms of calcium oxide was carried out in accordance with the method [6].

The agrochemical analysis of peat, ash, green mass of lupine, tohosomnia and torfosol-Lupin compost was performed in accordance with the methods [4,9].

The evaluation of the effectiveness of the studied composts (tortoreto) was carried out according to two criteria: a morphobiological criterion (the dynamics of growth, accumulation of plant biomass) and a chemical criterion (dry matter content, nitrogen, phosphorus and potassium in seedlings). The cleaning the sample of tomato seedlings was carried out in the phase of 6-7 leaves at the appearance of 1st flower brushes, for a different experience corresponds to the age of 55-60 days. In the course of a sample of seedlings was taken into account the weight of the aerial part and roots, linear length of plants, number of leaves on each plant[3]. Statistical analysis was performed using the program STATVIUA.

RESULTS AND DISCUSSIONS

The results of agrochemical analysis of initial components: peat, peat ash and green mass of lupine are presented in Table 1 .

Table 1.Agrochemical characterization of components of compost

Sample	Humidity,%	Ash, %	pH	Total, % on the raw substance			C,%
				N	P_2O_5	K_2O	
Peat ash	0.1	89.5	7.3	0.02	1.85	0.80	3.0
Top peat	74.0	15.5	4.6	0.25	0.08	0.02	42.2
Green mass of lupine	82.0	7.5	-	2.01	0.71	1.34	46.1

Source: Own determinations.

The total neutralizing capacity of peat ash in terms of calcium oxide made up 27-33%. The results of agrochemical analyses of the finished composts are presented in Table 2. The analysis of the obtained composts on total toxicity was made with the rapid method. The data obtained showed that the studied composts are non-toxic for plants.

Table 2. Agrochemical analysis peat-ash compost (PAC) and peat-ash -lupin (PALC) compost

Options	Ash, %	pH	Total, % on the raw substance			C,%	Toxicity, %
			N	P_2O_5	K_2O		
Control	5.6	4.0	1.18	0.28	0.01	47.2	21.3
PAC 1:1	60.1	7.2	0.59	0.78	0.21	23.2	5.6
PAC 1: 2	53.6	7.5	0.65	0.66	0.21	22.4	-
PAC 1: 3	59.5	7.4	0.32	0.58	0.24	20.2	6.9
PAC 1: 4	55.2	7.4	0.51	0.56	0.32	20.0	-
PALC 1:1:1	57.9	7.4	0.50	0.70	0.35	21.0	-
PALC 2:1:1	48.6	7.4	0.55	0.66	0.31	25.7	-
PALC 1:1:2	57.9	7.4	0.57	0.66	0.43	21.0	4.8
PALC 1:2:1	52.8	7.4	0.52	0.70	0.31	23.5	4.9

Source: Own determinations.

As a result of researches it is established that use of ash and green mass of lupine in compost mixtures with peat had a different effect on the development of tomato plants. The statistical processing of the obtained data showed that the introduction of peat ash and green mass of lupine part tortoreto had a significant impact on the qualitative characteristics of tomato seedlings (biomass, foliage, length of stem) in the options of experience, except for the variant with the ratio of peat and ash 1:2. The highest amount of biomass of the 1st plants was obtained in the variant with torfosol compost at a ratio of peat and ash 1: 4 and it was 6.3 g, which is 8.4 times more than in control (Table. 3, Fig.1).

Table 3. The effect of component ratios torfosol of composts on the quality of tomato seedlings

Options	The biomass of the 1st plants (natural moisture), g	The crude weight of the 1st plants, g		Linear length of plant, cm
		the above-ground part	Roots	
Control	1.2	0.9	0.3	5.3
PAC 1:1	3.8	3.1	0.7	15.8
PAC 1:2	2.5	1.9	0.5	13.2
PAC 1:3	3.6	2.8	0.8	20.8
PAC 1:4	6.4	5.2	1.2	24.5
PALC 1:1:1	3.3	2.6	0.7	18.2
PALC 2:1:1	4.8	3.8	0.9	22.,2
PALC 1:1:2	12.8	10.5	2.3	36.5
PALC 1:2:1	6.9	5.8	1.3	29.5

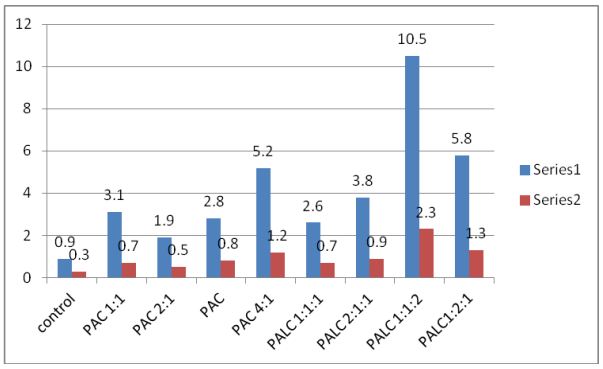
Source: Own determinations.

PALC have excelled themselves with the component ratio 1:1:2, the magnitude of the biomass of the 1st plants was 12.8 g and exceeded the control variant 17 times.

Use nourishing the soil with peat ash with different composition of components have influenced the chemical composition of plants (Table.4).

In the aerial part of seedlings grown on peat-ash the compost, the highest content of total nitrogen noted in the variant with the component ratio 1:4 it was 1.0%, while in the roots where its content was the lowest.

When growing seedlings on peat-ash-lupine the compost, the highest content of total nitrogen in the aboveground mass and roots it was observed in the ratio of components 1:1:2 and 1:2:1 to 1.08 and 1.20%.



Series 1-The above-ground part Series 2-Roots

Fig.1.The effect of component ratios in tohosomnia and torfosol-Lupin the composts on the formation of biomass 1st tomato plants

Source: Own design nased on experimental data

Table 4. The results of chemical analysis of tomato plants grown in peat-ash and peat-ash-lupine composts

Options	The above-ground part content, % for abs. dry substance		
	N_{total}	P_{total}	K_{total}
Control	0.48	0.22	0.51
PAC 1:1	0.85	0.43	1.70
PAC 1:2	0.80	0.72	1.60
PAC 1:3	0.74	0.43	1.60
PAC 1:4	1.00	0.53	1.53
PALC 1:1:1	0.80	0.53	1.84
PALC 2:1:1	0.80	0.53	2.00
PALC 1:1:2	1.08	0.62	2.40
PALC 1:2:1	1.20	0.58	2.52
Options	Roots content, % for abs. dry substance		
	N_{total}	P_{total}	K_{total}
Control	0.53	0.31	0.59
PAC 1:1	0.91	1.00	1.60
PAC 1:2	1.08	1.03	1.80
PAC 1:3	1.08	0.82	1.64
PAC 1:4	0.85	0.72	1.10
PALC 1:1:1	0.80	0.67	1.30
PALC 2:1:1	0.97	0.96	1.40
PALC 1:1:2	1.03	1.03	1.20
PALC 1:2:1	1.05	1.00	1.36

Source: Own determinations.

The minimum contents of nutrients in plants has been observed when growing seedlings on the peat.

Peat in this experiment can be considered as a substrate or as a basis of nutritious soil, and peat ash, and green mass of lupine in its composition are a source of nutrients for

tomato plants.

CONCLUSIONS

The obtained data testify the efficiency of the application of pear-ash and peat-ash-lupin composts as a soil nutrients for growing seedlings of tomato. The use of nourishing the soil with peat ash with different composition of components had a positive influence on the chemical composition of plants.

The introduction of peat ash and green mass of lupine part tortoreto had a significant impact on qualitative characteristics of tomato seedlings (biomass, foliage, length of stem) in the options of experience, except for the variant with the ratio of peat and ash 1:2.

The best biometric indicators of plants were obtained in a ratio of components in pear-ash compost 1: 4, peat-ash-lupin compost – 1:1:2.

The greatest biomass of the 1st plants was noted in the variant with pear-ash compost at a ratio of peat and ash 1: 4 and it was 6.3 g, which is 8.4 times more than in controls.

The peat-ash-lupin compost was the best option with the component ratio 1:1:2, the magnitude of the biomass of the 1st plants was 12.8 g and exceeded the control variant 17 times.

Peat can be considered as a basis of nutritious soil, and peat ash and green mass of lupine in its composition are a source of nutrients for growing tomato seedlings.

Given the short duration of the experiment, the data obtained can be considered advanced, despite of the statistically significant differences in the rate of quality characteristics of tomato seedlings.

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