



Secondary use of some types of wastes like soil-improvers in cultivation of pepper

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Introduction

The necessity of achieving of sustainable development in all areas of our life and the world shortage of raw materials bring to augmentation on the investigations in direction of utilization of the different types of wastes. In this connection the creation of complexes with technological cycle without generation of wastes is one of the most efficient directions for achieving of steadiness of the manufactures. The current work present the possibilities for realization of new "green technologies" for production of new types of soil-improvers on base of wastes, which are generated from pretreatment of biomass and cleaning of industrial waste gases. The application of these types soil-improvers with aim of achieving of higher yields which to provide the living of the population, prevention of the acidification and contamination of the agricultural lands and their recovery is demonstrated by different tests. In this work the analysis and assessment of the available elaborations for the receiving of soil-improvers from appropriate wastes, and their influence over the plants growth and the soil structure and soil properties are done. Also the experimental data from vegetations tests over the growth of two sorts of pepper (capsicum) at use of different rates of the soil-improvers are given. On base of these data are recommended the optimal compositions for practical application of the prepared soil-improvers.

Experimental

Each one of the used mixtures disagrees on moisture content and consistence in dependence from the quantity of the imported reagents. The mixtures which contain sulphuric acid were prepared in the following manner: the sulphuric acid was added to the biomass ash, slowly, in drops and at the same time, the mixture was continuously mixed for better homogenization and fragmentation of the formed agglomerates. After the addition of the whole quantity of sulphuric acid, slowly, in little portions, was added the green lye and the mixtures were further mixed to achieve full homogeneity. At preparation of the mixtures contenting ammonium sulphate, was ascertained the emission of the ammonia, most probably be due to the flow of the reaction between imported with the mixture the ammonium sulphate and substituting ammonium ion of ammonium sulphate with other cations. All mixtures are being stir until achieving full homogeneity to the imported components. Mixtures, which contain only biomass ash and green lye, were prepared in the following manner: the green lye was added directly to the biomass ash at constant mixing. The granulation of the mixtures was done by press granulation. Hydraulic press with potential for application of pressure up to 49.03 MPa, was used. The two used press-forms had inside diameter, respectively, 10 and 20 mm. The obtained granules are with a cylindrical form (Fig. 1) with geometric sizes (diameter and height), respectively: $d_1 = 10$ mm, $h_1 = 10$ mm and $d_2 = 20$ mm, $h_2 = 10$ mm.

The pot-tests are carried out in the period of 01.06 – 12.09.2010, at uninterrupted control of the moisture and the irrigation norm. The pepper (*Capsicum annum* L.) variety "Sivria ST" is used on the base of preliminary done literature investigation with the aim of establishing the conformity between the optimal condition of it's growing and the climatic condition of the cultivation region. For the experiments are used three soil conditioners with different composition (from two series S and M).

Four norms are used of manure with this soil conditioners, and each one of them is planted by three pepper plants. Also five comparative pot-tests with plants are used without adding of soil conditioners in them. The applied norms of manure are: 50 %, 100 %, 150 % and 200 % in relation with the optimal. Detailed scheme of implementation of the pot-tests is presented in Table 1.



Fig. 1. Soil-improvers granules obtained on base of biomass ash and green lye

Results

The primary data measured at the planting of the plant are accepted for "zero". The obtained data from the weekly measuring the parameters of the experimental plants (the taxonomic data) are compared with these primary data, and the reached data is generalized as value of growth (respectively: number augmentation) at each one measuring. Registration of the experimental values is done by means of direct observations and measurements in fixed period of days.

The calculated data are presented in next Tables and Figures.

Preparation of the used soil-improvers

Pot-tests experiments and composition of the used soil conditioners

Used norms of manure and scheme of the experiments

Generalized data

Table 1. Data for the total leaf number, at using of soil conditioner type S-8.

Code	Day of measuring														
	0	7	14	21	28	34	41	48	55	62	69	76	83	90	97
A00000	0	0,7	0,4	0,2	1,2	6,4	7	8,4	8,6	8,4	8,8	8,8	8,8	8,1	8,4
AS8T0,5	0	0	0,3	0,3	1,7	7	9,3	9,3	9,7	10,3	10	10	10,7	9,3	9,3
AS8T1,0	0	0,3	0,7	0,7	1,7	6,7	7,7	8	8,7	7,7	8	8,7	8	8	8,3
AS8T1,5	0	0	0	0,3	2,3	7	7	8,3	9	9	9	9,3	10,3	10	11
AS8T2,0	0	0	0,3	1	2,7	7	8	8,7	8,7	8,7	8,7	8,3	8,3	8,7	9
AS8II0,5	0	0,7	0,7	0,7	1,7	6,3	5,7	7	7,7	7,3	8	9	9	9,3	8,7
AS8II1,0	0	0	0,7	0,3	1	7,7	9	10,7	10,3	9,7	9,7	10,7	12	9,7	10
AS8II1,5	0	0	0,5	0	2	6,5	7,5	8	9,5	10	11	9,5	10,5	9	9
AS8II2,0	0	0	0,3	0	3	8	9,7	9	10,3	10,7	10,3	9,3	11	10	10,7

Table 1. Type and form of the used soil conditioner, code of the pot-test and norm of manure.

Code	Type of the soil conditioner	Form of the soil conditioner	Used norm of manure, g/kg dry soil
A00000	There is not		0
AS8T0,5	S-8	Granules	2,50
AS8T1,0	S-8	Granules	5,00
AS8T1,5	S-8	Granules	7,50
AS8T2,0	S-8	Granules	10,00
AS8II0,5	S-8	Powder	2,50
AS8II1,0	S-8	Powder	5,00
AS8II1,5	S-8	Powder	7,50
AS8II2,0	S-8	Powder	10,00
AS5T0,5	S-5	Granules	2,50
AS5T1,0	S-5	Granules	5,00
AS5T1,5	S-5	Granules	7,50
AS5T2,0	S-5	Granules	10,00
AS5II0,5	S-5	Powder	2,50
AS5II1,0	S-5	Powder	5,00
AS5II1,5	S-5	Powder	7,50
AS5II2,0	S-5	Powder	10,00
AM5T0,5	M-5	Granules	2,50
AM5T1,0	M-5	Granules	5,00
AM5T1,5	M-5	Granules	7,50
AM5T2,0	M-5	Granules	10,00
AM5II0,5	M-5	Powder	2,50
AM5II1,0	M-5	Powder	5,00
AM5II1,5	M-5	Powder	7,50
AM5II2,0	M-5	Powder	10,00

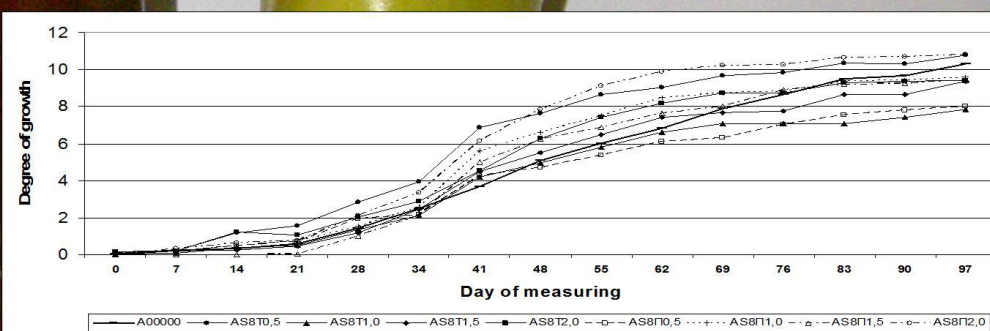


Fig. 2. Alteration of the stem height of the plants, at using of soil conditioner type S-8.

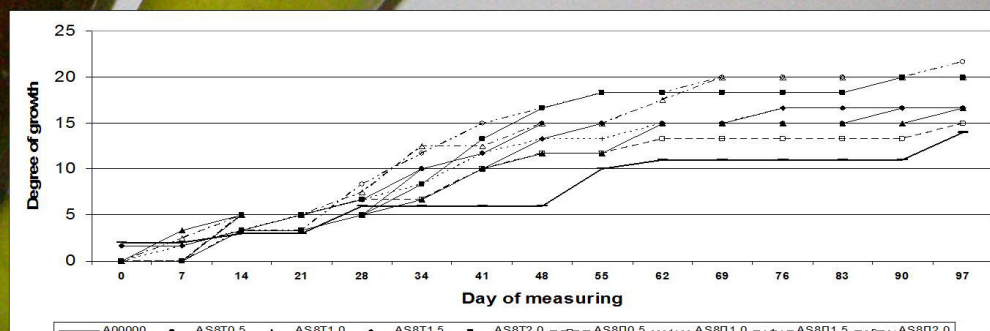


Fig. 3. Alteration of the stem height of the plants, at using of soil conditioner type S-8.

On the basis of the obtained results some preliminary conclusions may be drawn:

- that the most effective for growth of the pepper variety "Sivria ST" is soil conditioner type S-8 at norms of manure 5 and 7.5 g/kg – for the tablet form, and 7.5-10 g/kg – for the powder form.
- The results for this type of soil conditioner obviously are in connection with the high content of ammonium sulphate in it, which is the main source of nitrogen and sulphur respectively in ammonium and sulphate forms in soil solution, which can be assimilated easy from the plants.
- The tablet form use from this soil conditioner is preferable, because of the possibility of use of lower norms of manure.

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