

THE IMPROVEMENT OF SOIL QUALITY BY USING BIO-FERTILIZERS FOR MEDICAL AND AROMATIC PLANT CROPS

Adriana Bîra¹, Cristina Luntraru¹ Ștefan Manea¹, Gabriela Vlăsceanu¹, Marosy Zoltán²

¹ Hofigal Export Import SA, 2 Intr. Serelor, district 4, code 042124, Bucharest, Romania, terapii_noi@hofigal.eu, (40) 21-334.78.52

² Ecological University, Bucharest, Bd. Vasile Milea Nr.1G, Romania, marosy.zoltan@gmail.com, +40732 27 32 96, +40745 43 67 68

Abstract

Soil is the basic support of plant growth and such the development of life on Earth. Over time, agriculture was developed according to the requirements of humanity, so cultivated soil surfaces have expanded increasingly more. This has become a strain on production capacity of the soil, which led to a decrease in its physical and chemical qualities.

Concluding that in the 21st century the concern for human health and the environment it is a must, this paper has in view the improvement of soil quality for growing medicinal and aromatic plants regarding the major macronutrient content (NPK).

For that action it has been used 3 different types of bio-fertilizers (nearing of the forest, vegetal wastes and peat of conifers forest) in order to improve the soil quality and so there could be obtain higher quality crops of medicinal and aromatic plants.

Keywords: *ecology, organic farming, soil remediation*

1. Introduction

In the 21st century the medicine area advanced so much that you can find a chemical treatment for almost all kind of diseases. Most of us remembered that we are actually part of nature and all what we need we find in here. The phytotherapy is actually used for thousands of years, so it is in our attention for a very long time.

Peoples used plants for medical cures since ancient times and it is still a very good practice in our days too. The problem is that if we need healthy plants for a high quality, that including high efficiency of production and high standards of physical-chemical properties, we need to assure a healthy environment for development.

The most important environment element for medical plants is the soil because it is the support of their development. A rich nutrients support it may be the best way to obtain high quality medical plants production.

In this paper the authors tried to represent different types of bio-fertilizers in the sight to ensure a better quality support for medical and aromatic plant development. There have been used 3 different types of bio-fertilizers on the soil and the crops that were under the study are *Echinacea purpurea L.* and *Calendula officinalis*.

2. Materials and methods

The experimental study was performed in the year 2014 inside the S.C. HOFIGAL Export-Import S.A field. The bio-fertilizers that were used are nearing of the forest, vegetal wastes and peat of conifers forest in the order to obtain better medical plants

quality and the chemical analyses were performed in the Ecological University of Bucharest, by using a soil major macronutrients kit (*La Motte*).

There was been applied a suitable quantity of bio-fertilizers so that the physical structure of the soil not being too much influenced, but the chemical properties to be improved.

The bio-fertilizers were applied a single time after the spring technical soil operations and before the plants medical plants were planted.

The chemical analyses were made before applying the bio-fertilizers, after a month of application and after the cancellation of the organic crops.

Analysis of the soil quality has been carried out for the major macronutrients and for pH. As *analytical methods*, have been used for:^[1]

-*Mineral nitrogen*: NO₃ reduction from sap extracted in the presence of sulfanilic acid and naphthylamine; pink color by different intensity.

-*Inorganic phosphorus*: reduction of phosphomolibdenic acid with SnCl₂; blue-dark blue color by different intensities.

-*Potassium*: reaction with magnesium dipicrylaminat in an acid medium (HCl); red-orange-yellow color.

-*pH*: cholorymetric analysis by colors comparing.

Table no. 1. The nature of the soil reaction

The nature of the soil reaction	Variation intervals of the pH_{H_2O}
high acid	≤ 5,00
medium acid	5,01 – 5,80
poor acid	5,81 – 6,80
neutral	6,81 – 7,20
low alkaline	7,21 – 8,40
high alkaline	≥ 8,40

Table no. 2. Classes of content for total N in soil

Qualifier name	Admitted limits (%)
very low	≤0.100
low	0.100-0.140
medium	0.141-0.270
high	0.271-0.600
very high	≥0.600

Table no. 3. Classes of content for mobile P in soil

Qualifier name	Admitted limits (mg/Kg)
extremely low	≤4
very low	4-8
low	9-18
medium	19-36
high	37-72
very high	≥72

Table no. 4. Classes of content for mobile K in soil

Qualifier name	Admitted limits (mg/Kg)
extremely low	≤40
very low	41-65
low	66-130
medium	131-200
high	201-300
very high	≥301

3. Results and Discussion

Considering that the chemical analyses were made before applying the bio-fertilizers, after a month of application and after the cancellation of the organic crops, there have been obtained the next results:

Table no. 5 The result of the chemical analyses before applying the bio-fertilizers

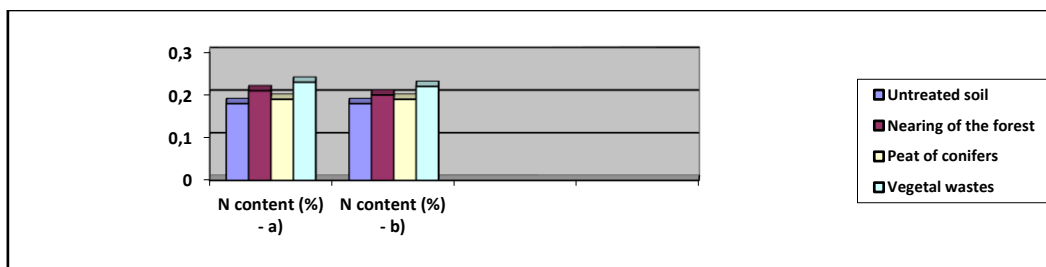
Crt. No.	Chemical parameter	M.U.	Results
1	Soil acidity - pH	-	7.8
2	Nitrogen (N)	%	0.18
3	Phosphorus (P)	%	0.31
4	Potassium (K)	mg/kg	2150

Table no. 6 The results of the chemical analyses after a month of bio-fertilizers applying

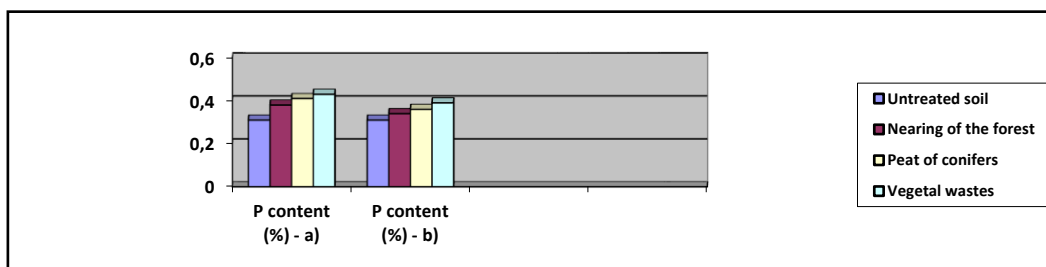
Crt. No.	Chemical parameter	M.U.	Results for the bio-fertilizers types		
			nearing of the forest	peat of conifers	vegetal wastes
1	Soil acidity - pH	-	7.9	7.7	7.8
2	Nitrogen (N)	%	0.21	0.19	0.23
3	Phosphorus (P)	%	0.38	0.41	0.43
4	Potassium (K)	mg/kg	2780	2656	2938

Table no. 7 The results of the chemical analyses after the cancellation of the organic crops

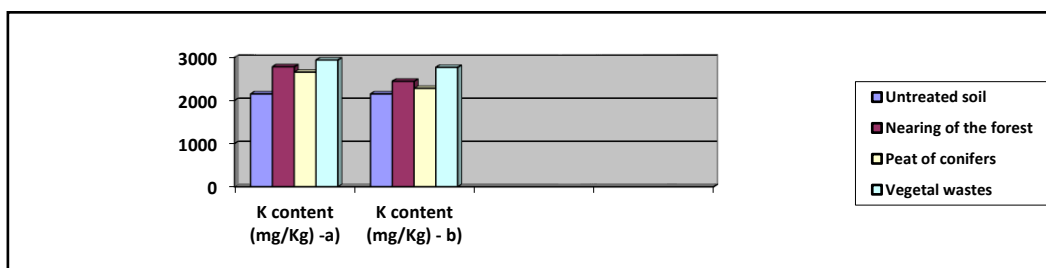
Crt. No.	Chemical parameter	M.U.	Results for the bio-fertilizers types		
			nearing of the forest	peat of conifers	vegetal wastes
1	Soil acidity - pH	-	7,8	7.7	7.8
2	Nitrogen (N)	%	0.20	0.19	0.22
3	Phosphorus (P)	%	0.34	0.36	0.39
4	Potassium (K)	mg/kg	2445	2281	2767



Graphic no. 1 The Nitrogen content a)- a month after the treatment and b)-after the cancellation of the organic crops



Graphic no. 2 The Phosphorus content a)- a month after the treatment and b)-after the cancellation of the organic crops



Graphic no. 3 The Potassium content a)- a month after the treatment and b)-after the cancellation of the organic crops



a)

b)

Figure 1. The Echinacea purpurea L. plant - a) Treated soil, b) Untreated soil

4. Conclusions

- After the application of the bio-fertilizers the soil quality was significantly improved considering the major macronutrients content in all 3 cases (nearings of the forest, peat of conifers, vegetal wastes);
- The best bio-fertilizer was the vegetal waste because it improves the content in all 3 major macronutrients (NPK);
- Considering the results of the experiment all the vegetable waste resulted from the maintenance of the organic medicinal plants crops it is used to produce bio-fertilizer;
- The medicinal plants quality was improved;
- After the cancellation of the medicinal plants crops the soil quality regarding the NPK content it was still better than it was before the application of bio-fertilizers, so we can say that it has been done a soil remediation.

References

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