

Research Concerning the Influence of Municipal Sludge from the Water Treatment Station „Tetarom III” Cluj-Napoca Upon The Production of Dry Matter at Alfalfa

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Abstract. The goal of this study is to evaluate the possibilities to use the municipal sludge as a fertilizer in agriculture, especially upon alfalfa crop, with a very complex and precise methodology, in the conditions of assuring environment protection and human health integrity. Neutralizing city mud with the help of soil, considered a biological treatment station for water is one of the most important perspectives to protect the environment together with an increase of agricol production. In the new socio economical structures of Romania, the natural fertilizer is to be found less and less due to the decrease of the animal number, and also due to the way of their breeding, and the replacement of natural fertilizer with mud from the used water treatment, it is an alternative to use due to the sure advantages of the fertilized mud appliance. The effect of fertilization with municipal sludge upon the crop of alfalfa was studied within an experiment with eight variants in which there were applied different doses of city mud and natural fertilizer. Due to the appliance of municipal sludge it can be seen an increase of the content of dry matter compared to the control variant (with no fertilizers).

Keywords: municipal sludge, alfalfa, agricol production, natural fertilizer, dry substance, control variant.

INTRODUCTION

The increasing quantities of sludge produced by municipal wastewater treatment plants, raises more acutely the problem of their reintegration into the environment. Taking into account the great quantity of organic matter that sludge contains, one of the possibilities of achieving this goal is by using the sludge on agricultural lands (Davies, 1980).

Storage, recycling or use of such waste materials is one of the most difficult problems especially for large urban areas, but is not insignificant either within the rural communities. One of the possible solutions to remove them from those areas and to give them a useful destination, is to make them as part of the technological cultivation soil systems in different agriculture areas, taking into account the environmental protection and maintaining reasonable costs (Bruce, 1983).

Recovery of municipal waste in agriculture products is also determined by the absence of fertilizers and by the continuing growth of their prices, along with the fact that soil requires big quantities of fertilizers for obtaining high, stab. and efficient productions (Guidi, 1983).

The test results of fermented and dehydrated sludge within the wastewater treatment plant Tetarom III Cluj-Napoca, have shown that sludge can provide sources of organic matter for agriculture and significant amounts of macro and micronutrients.

The present paper aims to monitor the influence of municipal sludge on alfalfa dry weight production.

MATERIALS AND METHODS

The experience has been carried out during two experimental years, 2010-2011, and has been placed within the bill faeozom from Bolduț, Cluj County, owned by ARDS Turda. The soil is slightly alkaline with a pH of 8,07 within the Ao horizon and a 8,39 pH within Bt horizon, with a rate of 0.24% N, 41 ppm P and 342 ppm K. The experiences have been placed using the latin rectangle method in 4 repetitions with 8 variants: V1-control, V2 - 20 t / ha sludge, V3 - 30 t / ha sludge, V4 - 40 t / ha sludge, V5 - 60 t / ha sludge, V6 - 20 t / ha manure, V7 - 40 t / ha manure and V8 - 60 t / ha manure.

The sludge that has been used was provided by the wastewater from Cluj-Napoca. The sludge has been first fermented in methantanks and dried on platforms for 8 months, having the following characteristics: 3.56% N, 2330 ppm P, 816 ppm K and 7,06 neutral pH. The chemical analysis of the sludge and the soil profile characterization were provided by OSPA Cluj-Napoca. The biological material that has been used was alfalfa, Madalina variety, variety created by SCDA Turda.

RESULTS AND DISCUSSION

The studies regarding the effect of mud fertilization, manure, we obtained the following results: in the first experimental year, at the first sow and also at the second one there were obtained differences of production between the control variant and the variants with city mud appliance. The highest results are obtained when applied 20 t/ha city mud, at the first mow being determined significant increase of the production (5,29 t DM/ha). Also, the appliance of 20 t/ha mud leads to distinct significant production increase and at the second sow (3,63 t DM/ha), and the application of 40 t/ha city mud determine high production only at the second mow determine very signnificant production level only at the second mow (4,01 t/ha); and the increase of dose at 60 t/ha city mudd determine significant increase compared to the control variant (3,97 t DM/ha, compared to 2,98 t DM/ha). The results obtained in the first experimental year shows that, except the variant treated with 20 t/ha city mud, there are no important production increase compared to the control variant.

Tab. 1

Influence of the variant upon the production of dry matter at alfalfa
2010
- First mow -

Variant		%	Difference	Signifiante
V1- control variant t	4,47	100	0	Mt.
V2 - 20 t/ha mud	5,29	118,4	0,82	**
V3 - 30 t/ha mud	4,79	107,1	0,32	-
V4 - 40 t/ha mud	5,15	115,1	0,68	*
V5 - 60 t/ha mud	5,13	114,8	0,66	*
V6 - 20 t/ha manure	5,23	116,9	0,76	**
V7 - 40 t/ha manure	5,16	115,5	0,69	*
V8 - 60 t/ha manure	4,44	99,2	-0,03	-
	DL (p 5%)		0,55	
	DL (p 1%)		0,74	
	DL (p 0,1%)		1,01	

Compared the results of production at the first mow with the second one in the first experimental year can be seen that the effect of the city mud effect is manifested only beginning with the second mow.

Tab. 2

Influence of thiant upon the production of dry matter at alfalfa
2010
- second mow -

Variant		%	Difference	Significance Mt.
V1- control variant	2,98	100	0	
V2 - 20 t/ha mud	3,63	121,9	0,65	**
V3 - 30 t/ha mud	3,66	122,8	0,68	**
V4 - 40 t/ha mud	4,01	134,8	1,04	***
V5 - 60 t/ha mud	3,97	133,2	0,99	***
V6 - 20 t/ha manure	3,62	121,5	0,64	**
V7 - 40 t/ha manure	3,72	124,8	0,74	***
V8 - 60 t/ha manure	3,62	121,6	0,64	**
	DL (p 5%)		0,39	
	DL (p 1%)		0,53	
	DL (p 0,1%)		0,72	

In the second year at first mow, and at second mow, in the case of all experimental variant, we obtain very significant production increases as follows: the application of 40 t / ha sludge to obtain a yield of 7 85 t DM / ha to 5.98 t DM / ha to control, and the scythe II 3.79 t DM / ha compared to 2, 39 t DM / ha to control variant..

In the second experimental year, there are no differences between mows, regarding the production increase regarding the production level obtained towards the control variant.

Compared the obtained results in the two experimental years regarding the effect of fertilizing with mud upon the production of d. m. at alfalfa, starting with the second mow in 2011, it can be seen the superiority of the variant V4 (40 t/ha mud) that determine the highest production levels: appliance of doses higher than 40 t/ha mud are not justified regarding the production level obtained; the less production levels are obtained in the case of appliance of doses of 30 t/ha mud.

Analyzing the production results obtained at alfalfa fertilized with mud and manure, it can be seen that manure usage doesn't determine high production levels, higher than the fertilizers with mud in none of the experimental variant (20, 40, 60 t/ha manure).

At the same applied dose, 40t/ha nămol, respectively 40 t/ha manure, in the first year it can be seen significant high production in the case mud (9,15 t DM/ha față de 8,87 t DM/ha at the appliance of manure), situation that is maintained also in the second year (11,63 t DM/ha at the appliance of 40 t/ha mud and 11,32 t DM/ha at appliance of 40 t/ha of manure).

Tab. 3

Influence of the variant upon the production of dry matter at alfalfa
2011
- First mow-

Variant		%	Difference	Significance
V1- control variant	5,98	100	0	Mt.
V2 - 20 t/ha mud	7,26	126,3	1,58	***
V3 - 30 t/ha mud	7,37	123,2	1,39	***
V4 - 40 t/ha mud	7,85	131,2	1,87	***
V5 - 60 t/ha mud	7,57	126,6	1,59	***
V6 - 20 t/ha manure	7,50	125,5	1,52	***
V7 - 40 t/ha manure	7,62	127,3	1,63	***
V8 - 60 t/ha manure	7,57	126,6	1,59	***
	DL (p 5%)		0,15	
	DL (p 1%)		0,20	
	DL (p 0,1%)		0,27	

Research conducted in the two experimental years 2010-2011, the fertilization with a single dose of sludge shows that in general, production increases are obtained in all variants fertilized because of content its rich nutrients. The effect of these nutrients in sludge is extended in time, first year is estimated at 30-60% efficiency of total potential. Supersberg (1975) states that when applying municipal sludge every three years, export of nutrients will be as follows: first year 50%, second year 35% and 15% in the third year. It remains to be established experimentally in the third year, 2012, as was done export of nutrients in sludge.

Tab. 4

Influence of the variant upon the production of dry matter at alfalfa
2011
- second mow -

Variant		%	Difference	Significance
V1- control variant	2,39	100	0	Mt.
V2 - 20 t/ha mud	3,61	151,3	1,23	***
V3 - 30 t/ha mud	3,18	133,0	0,79	***
V4 - 40 t/ha mud	3,79	158,7	1,40	***
V5 - 60 t/ha mud	3,18	133,2	0,79	***
V6 - 20 t/ha manure	3,21	134,5	0,82	***
V7 - 40 t/ha manure	3,71	155,4	1,32	***
V8 - 60 t/ha manure	3,31	138,6	0,92	***
	DL (p 5%)		0,08	
	DL (p 1%)		0,11	
	DL (p 0,1%)		0,14	

CONCLUSIONS

Using manure as fertilizer is one way to reintegrate the material flow in nature of this source of nutrients.

Production increases made at alfalfa in two experimental years using manure to maintain the possibility of a significant quantity of nutrients (N, P, K and micronutrients) and at the same time reducing the consumption of chemical fertilizers needed to maintain high levels of agricultural production .

The variable is the application of doses of 40 t / ha manure resulted in obtaining very significant increases production (9.15 t / ha respectively su 11.63 t / ha su to control variant fertilized with a production of 7, 44 t / ha respectively su 8.36 t / ha DM).

Fertilization with manure on alfalfa culture leads to considerable production increases to control variant fertilized, the better the application of 40 t / ha manure.

In terms of production dose equivalent municipal sludge can find that can successfully replace manure, this is a reliable alternative because of the advantages of using manure as fertilizer application.

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