ПРОУЧВАНЕ ВЛИЯНИЕТО НА ЧЕРНОМОРСКИ САПРОПЕЛИ ВЪРХУ КАЧЕСТВОТО И КОЛИЧЕСТВОТО НА ХУМУСА ПРИ ПСЕВДОПОДЗОЛИСТА ПОЧВА (PLANOSOL)

НИКОЛАЙ НИКОЛОВ, НЕДЯЛКА АРТИНОВА
АГРАРЕН УНИВЕРСИТЕТ – ПЛОВДИВ

STUDYING ON THE INFLUENCE OF BLACK SEA SAPROPELLES ON THE QUALITY AND CONTENT OF HUMUS AT CINNAMONIC PSEUDOPODZOLIC SOIL (PLANOSOL)

NIKOLAI NIKOLOV, NEDYALKA ARTINOVA
PLOVDIV AGRICULTURE UNIVERSITY

Abstract
The investigation was carried out at the period May – July 1997. Sapropelles were added at amount 1% and 2% to samples of cinnamonic pseudopodzolic soil. After 45 days incubation at aerobic conditions the content of humus was established. The results obtained was shown that at the variety with 2,0% the content of humus increases with 0,2%.

Key words: Blak Sea sapropelles, incubation, humus, cinnamonic pseudopodzolic soil

Abreviations
1. CPS –Cinnamonic pseudopodzolic soil

I. INTRODUCTION

During last years, agricultural specialists set many times the question about soil humus content. Assimilation of uncultivated agriculture lands as rule lead to decreasing of soil humus content of the till horizon. It could be explained by disturbing of nature biological stuffs cycle, because of bringing out of biomass by the crops, or by the mechanical movement of plant covering – organogenesis horizon and humus-assimilating horizon with deeper lying poor of humus horizon. A similar phenomena processes at soils, where the till horizon don't go out the borders of humus-assimilating horizon as by the case with cambisols. That's why the most probably reason for humus decreasing is the cultivation and related to it mineralization of the organic stuff. By such facts is clear that parallel with using of

soils with weak storage of organic stuffs, is necessary to take care about humus content stabilization.

During last decades, sapropelles come to be a subject of special research, because of the opportunity for their application in several aspects of agriculture, related to the soil fertility. /2, 3/

The aim of present work was to establish the influence of substrates, containing sapropelles on the humus state at low fertile soils as cinnamonic pseudopodzolic soils (Planosol), (CPS), in relation to support an optimal balance of organic stuff.

II. MATERIAL AND METHODS

1.Chemical composition of sapropelles

To determine the macro- and microelements content in the sample of the used sapropelles, inductively coupled emission spectrometry (John Yvon Emissiom – JY 38S, France) was used. The quantitative measures were carried out wirh apparatus ICP.

2.Incubation of soil with sapropelles

As object of investigation was used CPS (Planosol), taken from the area of Zlatosel village (Plovdiv region). Soil samples from a surface soil horizon and both undersurface layers of SPS were incubated with sapropel at amount 1,0 % and 2,0 % introduced as water-mechanical suspension. The incubation was lead at room temperature by full soil water storage in the periods of 1, 2 and 3 months. Clear manifesting alterations on the quality of soil humus were established a month after incubation. The humus content was established by an express method of Cononova and Belchikova (1). Independently of the express character of the mentioned method, some additional analyses were made after a 45 days incubation. As test about humus state of samples were used data of parameters of humus indexes of Orlov and Grishina (5), adopted according the diapason of values at the Bulgarian soils– Artinova (4).

III. RESULTS AND DISCUSSION

Table 1.2 illustrated the content of macro and microelements in the used sample of sapropelles. Except macro- and microelements sapropelles contain organic carbon. The lost while heated at 1273 K was 19,97%, due mainly to a content of organic matter.

It was established that in a layer 0-10 cm, the content of organic carbon ($C_{org.}$) increases with 0,2% by the both varieties of samples (1,0%, 2,0% sapropel) and with about 0,1 -0,4% at more deeper layers by the second variant, containing 2,0%. The humic acids content marked a tendency of decreasing with increasing of insoluble humic residue. Parallel with that decrease the part of humic acids, bound with calcium, especially at the variety with 1,0% sapropel. It prove the mobilizing action of Fe^{3+} and Al^{3+} in the sapropel composition on the humic acids of non-forming organic stuff and the opposite effect – fixation and immobilization of the organic components of non-hydrolized residue (humin) of Ca^{2+} & Mg^{2+}. The experimental data are shown at tables 3, 4, 5.

Chemical composition of sapropelles. Content of microelements

Table 1

№	Sample oxides	Cr g/t	Mo g/t	Zn g/t	Mn g/t	Pb g/t	Cu g/t	Ni g/t
1	Sapropelles	50.00	36.40	65.82	383.42	28.22	36.63	49.75

Chemical composition of sapropelles. Content of micro- and macroelements

Table 2

Sample Oxides	SiO_2 %	TiO_2 %	$A1_2O_3$ %	FeO/ %	MnO %	MgO %	CaO %	Na_2O %	K_2O %	Loss /%/ by 1273 K
Sapropelles	**39.76**	**0.70**	**11.69**	**4.57**	**0.04**	**2.68**	**15.46**	**2.13**	**1.83**	**19.97**

Content and fractional composition of humus after 45 days incubation of sapropelles in CPS (Planosol)

Table 3

Deep of horizon /cm/	General C_O /%/	%C_O from C_G				Insoluble residue /%/	$\sum C_{ha}/C_{fa}$ -	%C from C_O of humic acids	
		Extracted with 0,1n H_2SO_4	Extracted with $Na_2P_2O_7/NaOH$					Free and bound with R_2O_3 h.a,%	Bound with Ca humic acids, %
			Generally	Humic acids	Fulvo acids				
0-10	0,70	0,059 8,33	0,34 48,39	0,176 20,77	0,195 27,65	0,364 51,60	0,75	83,08	16,95
10-28	0,28	0,105 37,10	0,148 52,20	0,053 18,62	0,095 33,92	0,135 47,79	0,56	100,00	0,00
28-40	0,18	0,086 48,00	0,096 53,46	0,039 21,76	0,057 31,70	0,083 46,54	0,68	13,59	86,41
Sapropel 1	4,031	-	0,6148 15,25	0,1261 3,13	0,4887 12,12	3,4162 84,75	0,26	0,00	100
Sapropel 2	3,98	-	0,5836 14,66	0,1223 3,07	0,4613 11,59	3,3964 85,34	0,26	0,00	100
Sapropel 3	3,92	-	0,5690 14,51	0,1187 3,03	0,4503 11,49	3,351 85,48	0,26	0,00	100

Legend:
C_G – general content of carbon
C_O - organic carbon
C_{ha}/C_{fa} – correlation between C of humic acids and C of fulvo acids

Content and fraction composition of humus after 45 days incubation of sapropelles in CPS (Planosol)

Table 4

Content of sapropel /%/	Horizon, depth /cm/	General org. C in soil / %/	C,%					Ch.a. Cf.a.	%C from C_g of humic.acids extracted with 0,1n NaOH	
			Extracted with 0,1n H_2SO_4 /%/	Extracted with 0,1m $Na_2P_2O_7$ + 0,1n NaOH			Nonhydrolized residue /%/		Free and bound with C R_2O_3 .%	Bound with Ca /%/
				General C /%/	Humic acids /%/	Fulvo acids/ %/				
1,0 %	$A_1A_2L_{/g/}$ 0 - 10	0,905	0,075 8,29	0,295 32,6	0,108 11,93	0,187 20,66	0,61 67,4	0,58	0,108 100	-
	$A_2I_{/g/}$ 10 – 28	0,312	0,057 18,27	0,235 75,32	0,0820 26,28	0,153 49,04	0,077 24,68	0,53	0,0821 100	-
	$A_2I_{/g/}$ 28 – 40	0,218	0,104 47,71	0,15 68,81	0,064 29,36	0,086 39,45	0,068 31,19	0,74	0,038 59,37	40,63
2,0 %	$A_1A_2L_{/g/}$ 0 – 10	0,905	0,075 8,29	0,28 30,94	0,086 9,50	0,194 21,44	0,625 69,06	0,44	0,0851 98,95	1,05
	$A_2I_{/g/}$ 10 – 28	0,739	0,0818 11,07	0,23 31,12	0,076 10,28	0,154 20,84	0,509 68,88	0,49	0,0736 96,842	3,1587
	$A_2I_{/g/}$ 28 – 40	0,307	0,0614 20,00	0,14 45,60	0,062 20,20	0,078 25,41	0,167 54,4	0,79	0,0194 31,29	68,71

Notice:
The values of numerators of fractions are absolute %, and in undermarks – relative %.

CONTROL
Content and fractional composition of humus in Zlatosel Planosol (Plovdiv district, forest) and Blak Sea sapropelles

Table 5

Deep of Horizon /cm/	Ct in soil	% C_0 of Ct					Cha Cfa	C_0 % from all ha,% Humic acids extracted with 0,1n NaOH	
		Extracted with 0,1n H_2SO_4	Extracted with 0,1M $Na_2P_2O_7$ +0,1n NaOH			Non-hydro-lysable		Free or R_2O_3 bounded	Ca Comple-xed
			Total C_0	Humic acids	Fulvo acids				
$A_1A_2L_{/g/}$ 0 -10	0,70	0,059 8,33	0,34 48,39	0,176 20,77	0,195 27,85	0,364 51,60	0,75	83,08	16,95
$A_2I_{/g/}$ 10 –28	0,28	0,105 37,10	0,148 52,20	0,053 18,62	0,095 33,92	0,135 47,79	0,56	100,00	0,00
$A_2I_{/g/}$ 28 –40	0,18	0,086 48,00	0,096 53,46	0,039 21,76	0,057 31,70	0,083 46,54	0,68	13,59	86,41
Sapropel 1	4,03	-	0,6148 15,25	0,1261 3,13	0,4887 12,12	3,4162 84,75	0,26	0,00	100
Sapropel 2	3,98	-	0,5836 14,66	0,1223 3,07	0,4613 11,59	3,3964 85,34	0,26	0,00	100
Sapropel 3	3,92	-	0,5690 14,51	0,1187 3,03	0,4503 11,49	3,351 85,48	0,26	0,00	100

Legend: C_t – total carbon organic in soil, C_0 - organic carbon for fraction
Cha – correlation between C of humus acids and C of fulvo acids Cfa

IV. CONCLUSIONS

1. Sapropel is a factor of humus content increasing at its inert part – non-hydrolized residue, without any influence of its quality ($C_{h.a.}/C_{f.a.}$).
2. In the extracted humus residue was marked increasing of fulvo acids content at the sinamonic layer by the variety with 1,0%.
3. By lower content of sapropel (1%) dominates the correcting effect by the side of aluminum and iron compounds over the acid-alkali soil system, and by more higher content (2.0%), this effect is a consequence of influence of calcium and magnesium compounds in its composition.
4. The Black sea sapropelles can be used for improving the quality and quantity of the humus by soils poor of organic matter.

V. LITERATURE

1.Cononova, M., N.P.Belchikova. Accelerated method of determination of humus composition at mineral soil Soil Science №10, Moscow, 1961

2. Dimitrov, P., D. Dimitrov, D. Solakov. Application of Black Sea bottom sediments for natural ecological fertilizer and recultivation of exhausted soils, Intern. Conference Geology and Mineralogy Resources of The Black Sea", Kiev, 24-28 November, 1999, N.182,p. 418.

3. Dimitrov, P. V. Velev. Opportunities of using of deep-water sapropeloide slimes of Black Sea for agrobiological and industrial purposes, Ocealology, b.3, p.92-95, Sofia BAS, 1988

4. Giurov, G., N .Artinova. Soil science, Macros, Plovdiv, 2001

5. Orlov, D.S., L.A.Grishina. Practical guidance of humus chemistry, Moscow, 1981