STUDY CONCERNING SOME PHYSICAL AND CHEMICAL PROPERTIES OF THE SEDIMENTS FROM DRAINS IN THE PILOT FIELD FROM CEFA, BIHOR

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Abstract

The researches were carried out in the pilot field for drainage Cefa Bihor was founded in 1982 and the paper presents the research results regarding the sediments composition from drains. The analysis were made in 2009 and emphasize the biggest quantity of sediments from drains in the variants with distance of 30 m between the drains line, and short filter, 625 g/linear meter of drains; the smallest sediments were determined in the variant with drainage distance of 15 meter, high filter and deep loosening, 144g/linear meter. The $CaCO_3$ sediments content is median (4.71%) in the variant with drains placed of 30 m distance and short filter and small (0.35%) in the other 4 variants. The colloid clay content is very high, till 63%. A direct correlation, statistically assured between the quantity of the sediments from drains and the quantity of vegetation from collector channel was quantified. The results researches sustain the need of the deep loosening associated with drainage and to control the vegetation from collector channel.

Key words: drains, filter, collector canal, vegetation, sediments.

INTRODUCTION

There are 5,530 thousands hectares with water logging in Romania; 34.1% from the surfaces with surface-drainage and drainage works are situated in the Western Plain of Romania. The behavior in exploitation of the drainage works is very important (Sabău, 2009, 2010) and the paper studies the physical and chemical properties of the sediments from drains after 18 years since the beginning of functioning.

MATERIAL AND METHODS

The researches were carried out in the pilot field of Bihor County, Western Romania, in the year 2009; the pilot field for drainage was set up in 1982. The area belongs to quaternary from geological point of view.

The soil from drainage field is a humic clay one with different degrees of salinization. The soil is characterized by high content of colloid clay and bulk density (till 1.6 g/cm^3) and the penetration resistance indicates a settled soil. The saturated hydraulic conductivity has high values on the surface (6.1 mm/h), average – low on the other depths.

The area climate is temperate, moderate wet with average yearly temperature of 10.4ºC and yearly rainfall of 620.0 mm. Climate index (de

Martonne aridity index, Domuta Climate Index) characterizes the cold season from "moderate wet" to "excess wet" and the warm season is characterized as "moderate dry – very dry " (Domuţa, 2009).

The depth of the ground water is 0.5 - 4 m depending on the rainfall regime. The presence of the water logging in this area is due to the rainfall regime and low natural drainage, both external (due to the small slope of the land) and internal (due to the presence of the soil horizons with much clay, almost water proof).

For sediments properties, determinations of the profiles on the drain line were made at 15 m distance from drains mouths.

The texture elements of the sediments were determined by Kacinski method (Obrejeanu Gr et all. 1964); the macrostructure hydro stability was determined by Henin – Feodorff method (Domuţa, 2009), the calcium carbonate was determined by Scheibler method and pH was determined by potentiometric method (Brejea 2009, 2010).

RESULTS AND DISCUSSION

The quantity of sediments from drains and the link with the vegetation from the collector canal.

The biggest quantity of sediments was determined in the variant with unsystematic drainage, i.e. 242 g/m.l. In the variant with systematic drainage without scarifying, the biggest quantity of sediment was of 220 g/m.l.

Vegetation was determined on the right and on the left part of the drain mouth in 4 repetitions. It was determined in the variant with drainage distance of 30 m and short filter; it was followed by the variant with 30 m drainage distance and high filter and by variant with 15 m drainage distance and high filter. The scarifying determined a smaller quantity of sediments in all variants; differences in comparison with the variant without scarifying were of 40% in the variant with short filter and 30 m drainage distance, of 25 % in the variant drainage distance of 15 m and high filter, and of 24% in the variant with drainage distance of 30 m and high filter (table 1).

Table 1

The quantity of sediments from drains in different variants, Cefa, Bihor 2010

Variant	Sediments	
	g/m.l	%
1. Drainage, d = 15 m, high filter	190	100
2. Drainage, d = 15 m, high filter + scarifying	144	75
3. Drainage, d = 30 m, high filter	208	100
4. Drainage, d = 30 m, high filter + scarifying	160	76
5. Drainage, d = 30 m, short filter	220	100
6. Drainage, d = 30 m, high filter + mole drain	132	60
7. Unsystematic drainage	242	110

The following species were determined near drains mouth: *Mentha piperita, Carex sp., Daucus carota, Symphytum officinalis, Achilea milefolium, Rubus caesius, Cirsium arvense, Statica gmelini, Carduus mutans, Aristolochia clematitis, Solanum nigrum, Poa pratensis.*

The biggest quantity of vegetation was determined at the drains mouth from the variant with unsystematic drains, 23.3 kg/ml. The scarifying determined a smaller quantity of vegetation in all variants. The smallest quantity of vegetation was determined in the variant with 15 m drainage distance (table 2).

There is a direct link between the quantity of sediments from drains and the quantity of vegetation harvested near the drains mouth (figure 1).

Table 2

The vegetation harvested from the canal in front of drain mouth, Cefa Bhor, 2010

Variant	Vegetation	
	kg/m.l	%
1. Drainage, d = 15 m, high filter	16.9	100
2. Drainage, d = 15 m, high filter + scarifying	14.4	85
3. Drainage, d = 30 m, high filter	20.8	100
4. Drainage, d = 30 m, high filter + scarifying	17.0	82
5. Drainage, d = 30 m, short filter	21.7	100
6. Drainage, d = 30 m, high filter + mole drain	15.5	71
7. Unsystematic drainage	23.3	107

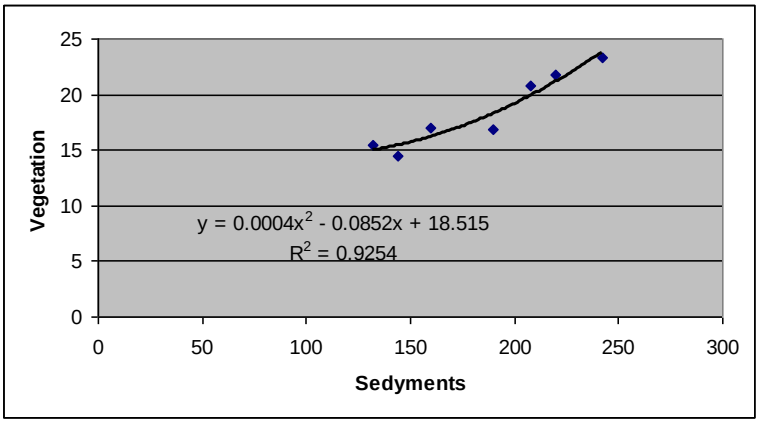

Fig. 1. Correlation between the quantity of sediments from drainage and quantity of vegetation from the collector canal

The physical properties of the sediments from drains

The texture elements have different values in the variants studied. The values of the sand are between 9.17% (variant with drainage distance of 30 m, high filter and scarifying) and 10.3% (variant with unsystematic drainage). The fine sand has the values between 22.96% (unsystematic drainage) and 26.77 % (variant with drainage distance of 30 m, high filter

and scarifying). The silt content is between 17.93% (variant with drainage distance of 30 m high filter and scarifying) and 22.80% (variant with drainage distance of 30 m, short filter and mole drain). The clay content is between 41.90% (variant with drainage distance of 30 m, short filter and mole drain) and 46.92% (unsystematic drainage). In all the texture elements, the differences in comparison with the control sample (variant with drainage distance of 30 m, high filter) are insignificant statistically (table 3).

Table 3

The texture elements of sediments from drains, Cefa Bihor 2010

Variant	Texture elements, mm			
	Sand >0,2	Fine sand 0,2-0,02	Silt 0,02-0,01	Clay 0,01-0,002
1. Drainage, d = 15 m, high filter	9.72	25.78	19.75	44.75
2. Drainage, d = 15 m, high filter + scarifying	9.96	26.12	21.30	42.62
3. Drainage, d = 30 m, high filter	9.17	26.77	17.93	46.13
4. Drainage, d = 30 m, high filter + scarifying	10.06	24.90	22.10	42.94
5. Drainage, d = 30 m, short filter	9.94	25.70	21.40	42.96
6. Drainage, d = 30 m, high filter + mole drain	10.20	25.10	22.80	41.90
7. Unsystematic drainage	10.32	22.96	19.80	46.92
LSD 5%	2.0	3.1	3.8	4.1
LSD 1%	3.1	6.3	6.9	6.4
LSD 0.1%	5.7	9.8	10.2	9.3

The values of the macrostructure hydro stability were between 26% (unsystematic drainage) and 35% (variant with drainage distance of 30 m, short filter and mole drain) but all the differences in comparison with control are insignificant statistically (table 4).

Table 4

Macrostructure hydro stability of the sediments from drains, Oradea, Bihor 2010

Variant	Macrostructure hidrostabillity	
	kg/m.l	%
1. Drainage, d = 15 m, high filter	28	100
2. Drainage, d = 15 m, high filter + scarifying	30	107
3. Drainage, d = 30 m, high filter	30	107
4. Drainage, d = 30 m, high filter + scarifying	32	114
5. Drainage, d = 30 m, short filter	32	114
6. Drainage, d = 30 m, high filter + mole drain	35	125
7. Unsystematic drainage	26	93

LSD 5% = 10; LSD 1% = 14; LSD 0.1 = 21

The chemical properties of the sediments from drains

The values of the pH are between 8.1% (the variant with unsystematic drainage) and 8.5% (drainage distance 30m, high filter and scarifying) but the differences in comparison with the control are insignificant statistically (table 5).

Table 5

Calcium carbonate content of the sediments from drains, Cefa, Bihor 2010

Variant	CaCO3	
	%	%
1. Drainage, d = 15 m, high filter	0.88	100
2. Drainage, d = 15 m, high filter + scarifying	0.82	93
3. Drainage, d = 30 m, high filter	0.90	102
4. Drainage, d = 30 m, high filter + scarifying	0.84	95
5. Drainage, d = 30 m, short filter	0.96	109
6. Drainage, d = 30 m, high filter + mole drain	0.90	102
7. Unsystematic drainage	1.12	127

LSD 5% = 0.4; LSD 1% = 0.7; LSD 0.1 = 1.1

The calcium carbonate content was between 0.82% (variant with drainage distance of 30 m, high filter and scarifying) and 1.12% (unsystematic drainage). The differences registered in comparison with the control are insignificant statistically (table 6).

Table 6

The values of the pH determined for the sediments from drain, Cefa, Bihor 2010

Variant	pH	
	Value	%
1. Drainage, d = 15 m, high filter	8,3	100
2. Drainage, d = 15 m, high filter + scarifying	8,4	101
3. Drainage, d = 30 m, high filter	8,2	99
4. Drainage, d = 30 m, high filter + scarifying	8,5	102
5. Drainage, d = 30 m, short filter	8,3	100
6. Drainage, d = 30 m, high filter + mole drain	8,4	101
7. Unsystematic drainage	8,1	98

CONCLUSIONS

The drainage research field from Cefa, Bihor, was founded in 1982 and the determinations, carried out in 2010 regarding the sediments from drains, emphasize the following conclusions.

The biggest quantity of sediments (242 g/ ml) was determined in the variant with unsystematic drainage and the smallest in the variant with drainage distance of 30 m, short filter and mole drain.

The scarifying perpendicular on the drain line determined a smaller quantity of sediments in the drains.

Vegetation quantities between 14.4 kg/ml and 23.3 kg/ml were determined in the collector canal near the drains mouth. In the variants with scarifying and with mole drain the vegetation quantities were smaller.

A direct link, statistically assured, was quantified between quantity of vegetation from collector canal and quantity of sediments from the drains.

There were not differences statistically assured between the texture elements (sand, fine sand, silt, clay), macrostructure hydro stability, pH, calcium carbonate content of the sediments from drains determined in the

control (variant with drainage distance of 30 m, high filter, without scarifying) and the other 6 variants studied.

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