

ANALYSIS OF CHEMICAL RISK FACTORS SURROUNDING SWINE FARMS IN TIMIS COUNTY

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KEY WORDS

chemical pollution risk, nitrate, phosphate, chlorides, soil samples

Background

Soil pollution by livestock waste is due to the management of animal waste resulting from farming activities, both in terms of collection and storage, and from the point of view of quantity and type used to fertilize farmland. In Timiș County, the area polluted by livestock waste is 282 ha. Swine manure application on soil for long period leads to increased levels of potassium, magnesium and phosphorus causing a disturbance of soil nutrient profile.

The consequences of using swine manure as part of soil fertilization consists in the quality of organic matter, nutrients, micronutrients and other additional factors such as additives, animal health products and pharmacological ones.

Materials and methods

Test samples used were from soils taken from five different locations: Pădureni, Parța, Voiteni, Peciu Nou and Ciacova. Samples were taken from a depth of 10 to 20 cm, in two places, at: I = 100-300 m and II = 500-1000 m away from swine farms for samples from localities Parța, Voiteni, Ciacova Pădureni, and for Peciu Nou was also collected a sample from a distance of over 1000 m from the swine farm present in the area. In addition to the samples in the vicinity of swine farms in Timis County we wanted to compare the results with those of soil samples taken without risk of pollution from swine manure, taken from a park of Timișoara city.

Methodology

In order to determine nitrates it was used about 2 g of sample in which it was obtained by drying manoeuvres, addition of bi-distilled water and centrifugation the supernatant used in determinations. From supernatant it was taken 1 ml and then added disulphonic acid and ammonium hydroxide, and the reading of samples was performed at 415 nm light weight.

For phosphates detection and rapid determination it was used an ammonium molybdate and hydroquinone test, a colour resulting, proportional to the concentration of phosphate present in sample (8). The samples reading in order to determine the amount of phosphate was realised at 655 nm.

Chlorides presence in samples was performed by using the test kit HI3815 (Hanna Instruments) by using in stages: diphenylcarbazone, nitric acid and mercuric nitrate, with a colour ranging from red-yellow-purple.

Results and discussions

In order to achieve calibration curve there were chosen three standards whose absorbance was read together with samples (Table 1).

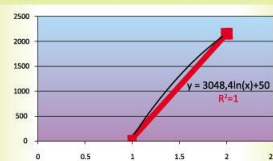
Table 1. Nitrates of test samples

Sample	Quantity of nitrates in sample (ppm)
1a	2.365
1b	2.605
2a	7.020
2b	1.850
3a	1.670
3b	1.375
4a	3.105
4b	4.570
4c	5.400
5a	3.865
5b	9.840
C	1.485



The calibration curve was traced in the Excel programme and there were calculated the line equation (y) and the correlation coefficient (R²) (Graph 1).

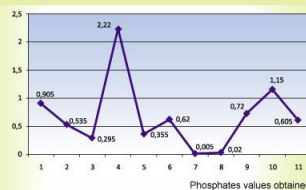
Graph 1 Calibration curve for standard samples



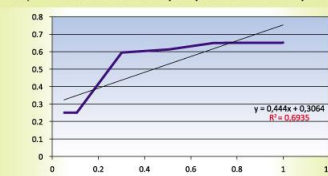
The results obtain after soil testing for phosphates in Banat County is presented in Table 2 and Graph 2.

Table 2 Amount of phosphate in samples

Sample No.	Quantity of phosphate in sample (ppm)			
	First reading	Second reading	First reading	Second reading
1a	0.905	0.960	0.745	0.745
1b	0.535	0.555	0.575	0.570
2a	0.295	0.235	0.275	0.265
2b	2.220	2.275	2.300	2.685
3a	0.355	0.330	0.315	0.275
3b	0.620	0.645	0.510	0.520
4a	0.005	0.005	0.025	0.015
4b	0.020	0	0.025	0
4c	0.720	0.735	0.575	0.605
5a	1.150	1.230	0.815	1.090
5b	0.605	0.605	0.525	0.545
C	1.225	1.240	1.200	1.315



Graph 2 Calibration curve for phosphate standard samples



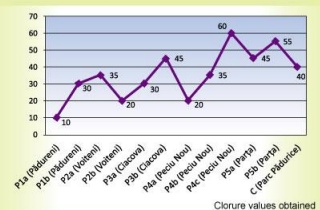
SAMPLES GATHERING



From the data obtained there are observed high levels of chlorides for samples at a distance of 500-1000 m from the values obtained at a short distance from the farm (area 100-300 m) (Table 3).

Table 3. The amount of chloride in test soil supernatant

Soil samples	Chloride levels after testing (mg/L)
P1a (Pădureni)	10
P1b (Pădureni)	30
P2 a (Voiteni)	35
P2 b (Voiteni)	20
P3 a (Ciacova)	30
P3 b (Ciacova)	45
P4 a (Peciu Nou)	20
P4 b (Peciu Nou)	35
P4 c (Peciu Nou)	60
P5 a (Parța)	45
P5 b (Parța)	55
C (Parc Pădureni)	40



Conclusions

The maximum amount of nitrate was recorded for sample 5b taken from a distance of 500-1000m from the farm in Parța.

Large amounts were recorded for samples from Voiteni and Peciu Nou and are not being dependent on the distance from the farm.

Minimum quantity of nitrate has been taken from sample 3b in Ciacova, at a distance from swine farm ranging between 500-1000 m.

In the soil sample collected from the area free from contamination with swine manure, sample C, there was a reduced amount of nitrates, but still higher than sample 3b, which is located on the perimeter of swine farms.

The largest amount of phosphate was observed for sample 2b taken from Voiteni and the minimum value recorded in testing was in Peciu Nou, both samples were collected from a distance from swine farms between 500-1000m.

The level of phosphates in sample C, sample located outside contact with swine manure was recorded as superior values from those obtained from swine farms around most of the locations investigated.

The maximum amount of chloride was obtained from Peciu Nou at a distance of 1000 m from the swine farm. Increased values were recorded in Parța from both harvesting locations, both at a distance of 100-300 m and at a distance of 500-1000 m from the farm.

The smallest amounts of chlorides were observed to be in Pădureni, at a distance of 100-300 m from the swine farm.

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References (23 authors)



SOIL SAMPLES