INFLUENCE OF THE VARIOUS CAPACITIES ACTIVITY AND PORK PRODUCTION TECHNOLOGIES PIG FARMS ON THE SOIL COVER ADJACENT TERRITORY STATE

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The activity of pork production enterprises is accompanied by the use, formation and accumulation of an organic matter significant amount, serves as a source of various pollutants formation, as well as an optimal center for the vital activity of macro- and micro biota. All these components can enter the environment in the area of pig farms, disrupting of the adjacent territory natural ecological state.

The use of accumulated waste as an organic fertilizer and their impact on the condition and quality of soil is the subject of research by many scientists [1, p. 61–71; 2, p. 114–122; 3; 4]. However, the opposite negative effect is also possible. It is believed that pollutants enter the soil cover mainly due to the introduction into it of an increased unbalanced amount of manure, often insufficiently purified, less often through direct ingress of pus from drains into the soil and groundwater in case of emergencies or improper waste storage [5, p. 60–61; 6; 7, p. 30–33; 8, p. 65–66]. However, the source of various environmental pollutants can also be technological processes of pig farming with all its production facilities, the way of storing waste, as well as the livelihoods of the animals on the farm with their natural physiological body [5, p. 61–62; 6; 9; 10].

We assume that the polluting components that enter the environment migrate to a certain distance in air space, followed by settling on the soil surface and along the soil profile of the adjacent territory. That can be tracked by comparing their presence at different distances from the farm. The state of the soil cover with a depth of 0-20 cm was investigated at a distance of 0 m, 250 and 500 m from the territories of various capacities and various pork production technologies farms. Farm 1: capacity – 1.5 thousand of pigs, technology – seasonal (traditional). Farm 2: capacity – 40.0 thousand of pigs, technology – flow-shop (industrial).

To characterize the chemical state of the selected soil samples on the studied farms, the following were determined: the content of the plants' main nutrients mobile forms – NPK; the content of components that can characterize the level of organic pollution – total nitrogen, chlorides; trace

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elements that can get into the soil from pig manure – Cu and Zn. The results of the established indicators are shown in Table 1.

According to the results of the upper soil layer chemical analysis, it was found that in the immediate vicinity near the Farm 1 territory (0 m), an increased presence of the most identified components was found in comparison with longer distances, namely: ammonium N, P_2O_5, K_2O, Cu, Zn. The traditional system of keeping animals and storing waste in piles in a dry form is practiced here. On Farm 2, as the distance from the farm territory changes (decreases), the content of only ammonium N, Cu and Zn changes, which characterizes the lesser influence of the anthropogenic factor on the state of the surrounding natural environment. An industrial system for keeping animals and storing waste in waterproofed lagoons is practiced here.

Microbiological analysis included the determination of the fungi total number; microorganisms that assimilate organic forms of nitrogen (microbial number); microorganisms that assimilate nitrogen mineral forms; nitrifying bacteria, which complete the nitrogen-containing compounds transformation cycle in the soil, oxidizing ammonia to nitrites and nitrates (Table 2).

The studies carried out revealed heterogeneity in the number of detected microorganisms in the upper soil layer, depending on the remoteness of the territory from farms. Since it is impossible to compare the number of detected microorganisms with their absolute values, which also exist in soils of different composition and properties, therefore, their absolute values were converted into relative ones and a cumulative assessment using an integrated indicator.

It was found that the number of detected microorganisms according to the integrated indicator is the highest in the immediate vicinity of the farm’s territories and decreases with the distance from these objects. Thus, the aggregate number according to the integrated indicator for Farm 1 at a distance of 250 m shows only a tendency to decrease, and significantly decreases only at a distance of 500 m, and on the Farm 2, this indicator significantly decreases already at a distance of 250 m, that is, the radius of the anthropogenic factor action at the number of micro biota on the Farm 1 is greater than on the Farm 2.

Thus, the heterogeneity of certain components at different distances from the pollution source (the farm's territory) indicates the pollutants migration formed because of the pork production enterprises activities. At the same time, the radius of the anthropogenic factor action on the adjacent territory state is somewhat less with the industrial keeping of pigs, while observing the appropriate environmentally oriented technological solutions.

Table 1

The results of the topsoil chemical analysis near the Pork farms

	Distance from the territory of farms, m	The investigated component							
		N general, %	N nitrate, mg/kg	N ammonium, mg/kg	P_2O_5, mg/kg	K_2O, mg/kg	Cu, mg/kg	Zn, mg/kg	CL, %
Farm 1	0 (control)	0,25 ±0,00	19,26 ±0,41	2,80 ±0,05	163,16 ±5,30	542,25 ±18,42	0,350 ±0,01	0,165 ±0,00	0,004
	250	0,24 ±0,00	17,34 ±0,67	2,02 ±0,07*	110,78 ±4,38*	99,41 ±3,05*	0,360 ±0,01	0,135 ±0,01*	0,004
	500	0,23 ±0,00	30,32* ±0,92	1,99 ±0,06*	109,35 ±2,59*	93,39 ±2,93*	0,300 ±0,01*	0,135 ±0,00*	0,004
Farm 2	0 (control)	0,22 ±0,00	4,43 ±0,08	5,84 ±0,12	107,34 ±3,74	87,36 ±2,51	0,345 ±0,01	0,315 ±0,01	0,002
	250	0,22 ±0,01	5,55 ±0,15*	2,94 ±0,08*	102,19 ±3,89	87,36 ±3,21	0,200 ±0,01*	0,275 ±0,01*	0,002
	500	0,21 ±0,00	8,00 ±0,35*	2,42 ±0,09*	106,79 ±3,78	93,39 ±2,33	0,015 ±0,00*	0,120 ±0,01*	0,002

* – statistically significant difference compared to distance 0 m (control), at $P \leq 0,05$.

Table 2

The results of the topsoil microbiological analysis near the Pork farms

	Distance from the territory of farms, m	Fungi, thous. CFU/g	Microbial number, mln. CFU/g	Microorganisms that assimilate nitrogen mineral forms, mln. CFU/g		Nitrifying bacteria, mln. CFU/g	
				total	actinomycetes	I phase	II phase
Farm 1	0 (control)	23,84 ±0,31	15,68 ±0,29	34,93 ±0,61	6,42 ±0,11	3,53 ±0,11	1,12 ±0,11
	250	19,09 ±0,47*	16,67 ±0,21*	31,01 ±0,40*	6,20 ±0,13	3,34 ±0,11	1,12 ±0,11
	500	15,26 ±0,43*	10,74 ±0,20*	30,74 ±0,55*	5,10 ±0,11*	2,87 ±0,11*	1,28 ±0,11
Farm 2	0 (control)	20,82 ±0,40	21,76 ±0,70	46,96 ±1,12	10,63 ±0,36	3,86 ±0,23	1,29 ±0,11
	250	23,49 ±0,59*	13,20 ±0,57*	29,15 ±0,90*	7,75 ±0,20*	3,22 ±0,11	1,45 ±0,11
	500	10,16 ±0,44*	13,53 ±0,46*	34,06 ±0,73*	7,80 ±0,15*	2,86 ±0,23*	1,27 ±0,23

* – statistically significant difference compared to distance 0 m (control), at $P \leq 0,05$.

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