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Influence of the adsorbent "Vitacorm-Reo-M" on pigs' growth dynamic and fodder conversion

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Abstract. The aim of the research was to study the effect of the supplementation of mixed fodders with the enterosorbent preparation "Vitacorm-Reo-M" at different levels, on the growth and the productive performances of pigs. The scientific and economic experiment was conducted in the conditions of the State Enterprise "Moldsuinhibrid" on Landrace x Pietrain hybrids, from 25.05.2012 to 05.11.2012. Four groups of pigs were formed, the control group was fed the basic fodder, and the fodder for the pigs in the experimental groups EG_1, EG_2 and EG_3 was supplemented with the enterosorbent preparation "Vitacorm-Reo-M" in the amount of 2.0, 4.0 and 6.0 kg/ton, respectively. The dynamics of body weight showed that at the end of the trial the weight difference between the groups CG and EG_2 was of 5.95 kg ($B \geq 0.95$), and between EG_2 and EG_3 – 3.58 kg ($B \geq 0.95$). The pigs in EG_2, which were fed a fodder supplemented with "Vitacorm-Reo-M" at a level of 4 kg/t, showed a higher growth rate; they reached the weight of 100.28 kg and the fodder conversion was the lowest (3.63 kg/1kg).
Key Words: pigs, live weight, mixed fodder, adsorbent.

Introduction. Microscopic fungi that produce mycotoxins are inevitably present in every kind of fodder. Mycotoxins, which are the products of the metabolism of microscopic imperfect fungi, constitute a large and diverse group of naturally occurring toxicants (Korostelyova & Koschaev 2010; Clear et al 2000). It was demonstrated that the presence of mycotoxins in fodder samples does not depend on seasons; they can be found there throughout the year (Koschaev & Hmara 2013).

Fodders contaminated with mycotoxins used in feeding farm animals may reduce their productivity, and cause immunosuppression or even death. One of the mechanisms of pathogenic action of mycotoxins may also be the induction of the process of free radicals formation and the initiation of lipid peroxidation reaction (Khachatourians 1990; Rizzo et al 1994). In many cases the production of free radicals may be an additional mechanism of toxicity, which can be more significant than the direct damage of cells (Atroshi et al 2002).

In order to reduce or prevent the adverse effects of mycotoxins on the health of farm animals, various mycotoxin adsorbents, zeolites, bentonites and activated coal are used, which do not usually adsorb only mycotoxins but also useful feed components such as vitamins and microelements (Trukhachev et al 2009).

A significant trend in the detoxification of fodders using enterosorbents is the obtaining of an adsorbent, which would not adsorb micronutrients such as vitamins and minerals. However, the dosages, methods of feeding, the specificity and the level of productive activity, stimulating, curative and other effects of these complex additives are not well understood.

Materials and methods. In order to study the effect of feeding pigs with a fodder supplemented with the enterosorbent preparation "Vitacorm-Reo-M" at different levels on their growth and productive performances, a scientific and economic trial was conducted in the period 25.05.2012–05.11.2012 at the State Enterprise for Pig Breeding and Hybridization "Moldsuinhibrid". The trial consisted of two periods: preparatory phase and actual trial.

As biological material 40 Landrace x Pietrain piglets were selected using the method of pair-analogues (Ovsyannikov 1976), which were then separated into four experimental groups, in accordance with the below scheme of the scientific and economic experiment (Table 1).

Table 1

Trial design

Group	*Number of animals, heads*	*Feeding features*
CG	10	BF (basic mixed fodder, barley up to 43%)
EG_1	10	BF + 2.0 kg "Vitacorm-Reo-M"/t
EG_2	10	BF + 4.0 kg "Vitacorm-Reo-M"/t
EG_3	10	BF + 6.0 kg "Vitacorm-Reo-M"/t

CG, control group; EG, experimental group, BF, basic fodder.
Note: The adsorbent "Vitacorm-Reo-M" is produced by the Limited Liability Company "RCP HIMTESERVIS", Ukraine; it is a complex preparation that contains vegetable dietary fibre (cellulose, lignin, hemicellulose, pectin), aluminium hydroxide, zinc oxide, microorganisms of the genus Bacillus subtilis, Lactobacillus, Bifidobacterium, Enterococcus, and their vital activity products, by-products of the process of yeast processing, lactulose, potassium humate, activated biopolymers, bentonite, vermiculite, acidifiers (organic acids: formic, acetic, propionic, lactic, fumaric, ascorbic, citric, sorbic), L-carnitine and betaine.

The pigs in the first group (control group) were fed the basic mixed fodder. Pigs in the experimental groups EG_1, EG_2 and EG_3 were fed the basic mixed fodder that was supplemented with the preparation "Vitacorm-Reo-M" in amount of 2.0, 4.0 and 6.0 kg per ton, respectively. The animals were fed three times a day; a record of fodder consumption was kept daily by weighing the quantity of fodder given to the pigs and the quantity of the remained fodder collected after one hour after feeding. Based on the obtained results the level of consumption was determined and the average feed consumption per head was calculated. Throughout the experiment all the experimental animals were kept under identical conditions.

The pigs' body weight dynamics were studied by individual weighing of the pigs at the beginning of the preparatory period, at the beginning of the experimental period and at the end of the trial (Figure 1). All the data obtained were statistically processed using the computer program Excel in accordance with the methods developed by Plohinskii (1969).

Figure 1. Individual weighing of the pigs during the trial.

Results and discussion. The experimental animals were fed mixed fodder (Table 2) prepared in accordance with the nutritional requirements adapted to the pigs' physiological state.

Table 2

The structure of the mixed fodder recipes

Ingredients %	*Experimental period*		
	up to 80 days	*81-120 days*	*121 – the end*
Corn	10,0	10,0	10,0
Barley	43,0	43,0	43,0
Wheat	11,5	11,0	11,0
Wheat bran	6,0	8,0	8,0
Extruded peas	8,0	8,5	8,5
Soybean meal	5,0	9,0	9,0
Sunflower meal	6,0	-	-
Fish meal	5,0	5,0	5,0
Premix	2,5	2,5	2,5
Salt	0,5	0,5	0,5
Chalk	0,5	0,5	0,5
Soybean oil	2,0	2,0	2,0

The nutritional value of the fodder rations corresponded to the feeding requirements described by Kalashnikov et al (2003) (Table 3). The calculation of the rations was performed using the special software programme "HYBRIMIN" (Germany).

Table 3

The concentration of nutrients in the mixed fodder

Specification	*Experimental period*		
	up to 80 days	*81-120 days*	*121 – the end*
Dry matter,%	85.25	85.24	85.24
Metabolic energy, Mj	12.70	12.79	12.79
Crude protein,%	15.01	15.46	15.46
Crude fibre,%	5.80	4.95	4.95
Crude Fat,%	6.44	5.65	5.65
Lysine,%	0.80	0.83	0.83
Methionine + Cystine, %	0.32	0.36	0.36
Threonine,%	0.34	0.35	0.35
Sodium,%	0.12	0.16	0.16
Calcium,%	0.76	0.75	0.75
Phosphorus,%	0.62	0.60	0.60

The individual weight of the pigs was recorded throughout the scientific trial. It was determined that the average body weight of the pigs at the beginning of the preparatory period ranged within 17.85–17.97 kg, and at the beginning of the actual trial within 18.50 to 18.81 kg (Table 4).

The dynamics of the body weight showed, that during all age periods the growing intensity of young pigs was quite high (between the groups); differences were noted in all age periods, namely: at the age of 4 months (at the end of the first experimental period) it was of 2.11 kg between the groups CG and EG_1, 3.79 kg between CG and EG_2 and 4.68 kg ($B \geq 0.95$) between CG and EG_3.

Table 4

Dynamics of the pigs' body weight, ($\overline{X} \pm S\overline{x}$)

Group	The average weight of the pigs during the trial, kg				
	at the beginning of		at the end of		
	preparatory period	actual trial	growth period	first experimental period	second experimental period
CG	17.85 ± 0.169	18.65 ± 0.174	29.75 ± 0.588	42.35 ± 1.571	94.33 ± 1.957
EG_1	17.78 ± 0.189	18.50 ± 0.206	29.74 ± 0.206	44.46 ± 1.807	96.68 ± 2.378
EG_2	17.79 ± 0.155	18.60 ± 0.176	31.00 ± 0.533	46.14 ± 1.192	100.28 ± 1.317
EG_3	17.97 ± 0.145	18.80 ± 1.148	30.84 ± 0.654	45.86 ± 0.680	96.70 ± 1.720

A higher growth rate showed the experimental pigs in EG_2, which reached the weight of 100.28 kg at the age of seven months; the body weight of the pigs in EG_1, EG_2, and EG3 compared to the CG increased by 2.49%, 6.31%, and 2.51% respectively. At the end of the trial the differences between the groups were as follows: the CG and EG_2 - 5.95 kg (B≥0.95), EG_2 and EG_3 - 3.58 kg (B≥0.95). Thus, the maximum mass was recorded in EG_2. In this group the pigs were fed a fodder supplemented with the adsorbent at the level of 4 kg/t.

Table 5

Average daily gain, kg

Group	Indices	Average daily gain, kg			
		during the preparatory period	during I growth period	during II growth period	on average during the trial
CG	$\overline{X} \pm S_{\overline{X}}$	0.089 ± 0.003	0.409 ± 0.026	0.559 ± 0.017	0.501 ± 0.012
	S ± Ss	0.011 ± 0.002	0.083 ± 0.019	0.055 ± 0.012	0.039 ± 0.009
	V,% ± Sv%	12.148 ± 2.716	20.305 ± 4.540	9.775 ± 2.186	7.767 ± 1.737
EG_1	$\overline{X} \pm S_{\overline{X}}$	0.080 ± 0.004	0.448 ± 0.030	0.562 ± 0.021	0.518 ± 0.015
	S ± Ss	0.011 ± 0.003	0.094 ± 0.021	0.066 ± 0.015	0.049 ± 0.011
	V,% ± Sv,%	14.344 ± 3.208	21.083 ± 4.714	11.703 ± 2.617	9.400 ± 2.102
EG_2	$\overline{X} \pm S_{\overline{X}}$	0.090 ± 0.006	0.475 ± 0.020	0.582 ± 0.019	0.541 ± 0.009
	S ± Ss	0.018 ± 0.004	0.000 ± 0.014	0.066 ± 0.015	0.028 ± 0.006
	V,% ± Sv,%	2.985 ± 4.545	13.202 ± 2.952	11.703 ± 2.617	5.254 ± 1.175
EG_3	$\overline{X} \pm S_{\overline{X}}$	0.094 ± 0.003	0.466 ± 0.011	0.547 ± 0.021	0.516 ± 0.011
	S ± Ss	0.008 ± 0.002	0.036 ± 0.008	0.068 ± 0.015	0.035 ± 0.008
	V,% ± Sv,%	9.017 ± 2.016	7.761 ± 1.735	12.359 ± 2.764	6.855 ± 1.533

The data on the average daily gain showed that the growth was stronger at the age of 6-7 months (the second growth period), when the average daily gain reached the highest values, but the highest value – 582 g, was recorded in EG_2.

The specific consumption of fodder during the experimental period was lower in the CG compared to all the experimental groups (Table 6).

During the trial an average daily specific fodder consumption within the limits of 1.96 and 1.97 kg was observed, with an index of fodder bioconversion lower in the CG compared with the groups EG_1, EG_2 and EG_3 by 0.11, 0.28 and 0.10 kg, respectively. The group EG_2, in which the pigs received a ration supplemented with "Vitacorm-Reo-M" at the level of 4 kg/t, registered a higher conversion index in comparison to the CG.

Table 6

Fodder consumption, kg

Trial phase	*Group*			
	CG	*EG_1*	*EG_2*	*EG_3*
During the first period of growth	309.994	322.500	319.922	317.356
During the second period of growth	478.222	477.722	450.444	479.056
During the growth-finishing period	2173.000	2171.167	2168.683	2174.611
During the experimental period (total)	2961.217	2971.389	2963.161	2971.022

Conclusions. The addition of the enterosorbent preparation "Vitacorm-Reo-M" to the mixed fodder for the pigs caused differences between their live body weights, namely: the weight difference between the pigs in CG and EG_2 was 5.95 kg (B≥0.95), and between the pigs in EG_2 and EG_3 - 3.58 kg (B≥0.95).

The optimal level of the adsorbent "Vitacorm-Reo-M" added to the mixed fodder is of 4.0 kg/t. The pigs in EG_2, which had been fed a fodder supplemented with the adsorbent at the level of 4.0 kg/t, showed a higher growth rate.

The supplementation of the mixed fodder with the "Vitacorm-Reo-M" at the level of 4.0 kg/t registered a higher conversion index in EG_2 (3.63 kg/1kg) in comparison with the CG.

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References

Atroshi F., Rizzo A., Westermarck T., Ali-Vehmas T., 2002 Antioxidant nutrients and mycotoxins. Toxicology 180(2):151–167.

Clear R. M., Patrick S. K., Gaba D., 2000 Prevalence of fungal and fusariotoxins on oat seed from western Canada, 1995-1997. Can J Plant Pathol 22(3):310–314.

Kalashnikov A. P. et al. 2003 Normu i ratsionu kormlenia seliskohoyiaistvennuh jivotnuh. Spravocinoie posobie, Moskva, p. 138–140. [In Russian]

Khachatourians G. G., 1990 Metabolic effects of trichothecene T-2 toxin. Can J Physiol Pharmacol 68(7):1004–1008.

Korostelyova L. A., Koschaev A. G., 2010 Ecology of microorganisms with the basics of biotechnology. Krasnodar: HPE "Kuban State Agrarian University", p. 274.

Koschaev A. G., Hmara I. V., 2013 Features of seasonal mycotoxin contamination of grains and animal feed in the Krasnodar region. Kuban Veterinary: http://vetkuban.com/num2_20138.html [last accessed: June 2013]

Ovsyannikov A. I., 1976 Osnovu oputnogo dela v jivotnovodstve, Kolos, Moskva, p. 304. [In Russian]

Plohinskii A. P., 1969 Rukovodstvo po biometrii dlia zootehnikov. Kolos, Moskva, p. 256. [In Russian]

Rizzo A. F., Hatroshi F., Ahotupa M., Sankari S., Elovaara E., 1994 Protective effect of antioxidants against free radical-mediated lipid peroxidation induced by DON or T-2 toxin. Zentralbl Veterinarmed A 41(2):81–90.

Trukhachev V., Filenko V., Rastovarov E., Zadorozhnaya B., Lyubaya S., Chabayev M., 2009 Feed additives of the new generation in pig farming. Compound Feeds Magazine 6:97.

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