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PRODUCTIVITY OF PIGS AND QUALITY MEAT WHILE FEEDING PREMIX "BIOLEKKS" AND BENTONITE

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Abstract

Researches on feeding with Biolekks premix and bentonite clay to pigs for fattening were conducted. It was established that the tested additives have beneficial effect on animals. However the greatest effect was obtained with combined feeding. So the live weight of pigs increased by 5.2% (at P≤0.999), surviving – by 4%, the level of profitability of pork production – by 18.6%, also revealed was the decrease of concentration of mercury in meat – by 37.5%.

It is obvious that Biolekks premix and bentonite has allowed balancing the diet with minerals, improving digestion of nutritious and biologically active components of feed, normalizing the metabolism, excreting heavy metals such as mercury, which all ensured the growth rate, the surviving of pigs and economic efficiency.

Key words: pigs, bentonite clay, premix, "Biolekks", live weight, mercury (hydrargyrum)

Introduction

The efficiency of pig production depends on increasing productivity through optimization of animal feed using local available feed resources. (Ryzhkov et al., 2014) As a source of minerals, along with the traditional creep feed in animal husbandry, it is recommended to use natural minerals, such as bentonites. In addition to their rich mineral composition, they have good sorption properties (Yarmots, 2014), improve the digestibility of the feeds, increase the utilization of nutrients, absorbtion in the gastrointestinal tract and eliminate the toxins, poisons, helminths' eggs. At the same time they have antibacterial characteristics (Mikolaychik et al., 2007; Karmatskikh, 2008; Yakovlev et al. 2008), increase host defense, reduce morbidity and mortality, increase the intensity of growth (Zhukova I. and Solovjeva, 2003; Lushnikov et al., 2004; Ovchinnikov, 2012).

Recently the use of biologically active substances derived from wood raw material as feed additives in the animals' diet has intensified. Annually about 500 tons of flammable waste in the form of husk cones are piled up in the places of pine nuts harvesting (Savin, 2006). The husk of Korean pine-cones contains triterpenoid saponins, tannins catechin, phospholipids, phytosterols, fatty acids, including linoleic, oleic, palmitic, and macro - and micro nutrients (Prikhodko, 2004).

The purpose of this work is to study the productivity of pigs and meat quality while feeding premix "Biolekks" and bentonite.

Materials and Methods

The scientific investigations took place in 2014, in OJSC stud farm "Shuvaevsky" in Yemeljyanovo region of Krasnoyarsk Krai, on hybrid pigs, obtained by crossing breeds landrace×large white×duroc.

For the experiment 4 groups of analogue (similar) pigs were formed according to their level of health, origin, age, live weight and development. Daily the pigs of the experi-

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Table 1
The scheme of the first experiment of feeding pigs with premix "Biolekks" and bentonite clay in combination and separately

Group	Quantity, heads.	Duration of experiment, days	Feeding schedule
Control	50	50	Basic diet (BD)
1st experimental	50	50	B.D. + premix «Biolekks» (5g/head)
2nd experimental	50	50	B.D. + bentonite clay (25g/head)
3rd experimental	50	50	B.D. + premix «Biolekks» (5g/head) + bentonite clay (25g/head)

mental groups were fed with premix "Biolekks" and bentonite in addition to their basic diet, in complex and separately, in accordance with the scheme of experiment presented in Table 1.

Bentonite clay was mined in Khakassia Republic. The clay is a homogeneous free loose powder of grey clolour, odourless. Mass fraction of montmorillonite is no less than 60 %.

Premix "Biolekks" was produced in Khabarovsk science and production association (SPA) "Biolekks". It includes the extract of the husk of cones of the Korean pine, wheat flour, minerals (sulfate, iron, zinc sulfate, manganese sulfate, sodium Selenite, potassium iodide, cobalt chloride), fat soluble vitamins (A, D3, E, K) water soluble vitamins (C, B1, B2, B3, B4, B5, B6, B12), amino acids (methionine and lysine).

Results and Discussion

For determining the effect of premix "Biolex" and bentonite clay at a live weight the pigs were weighed at the beginning and at the end of the experiment (Table 2).

Table 2
Dynamics of live weight for pigs for fattening

Group	Live weight, kg	
	at the beginning	at the end
Control	65.8±0.32	102.0±0.30
1st experimental	67.1±0.30	107.0±0.32*
2nd experimental	64.5±0.22	105.0±0.25*
3rd experimental	64.6±0.32	107.6±0.31*

Upon reaching 161 days of age the live weight of pigs in the control group was lower than in the experimental groups. Thus, the live weight in the 1st experimental group exceeded the weight of the control one by 4.7 % ($P < 0.999$), the 2nd group by 2.9% ($P < 0.999$) and the 3rd experimental group by 5.2 % ($P < 0.999$).

Analysis of the live weight and its growth indicates that the tested additives of premix "Biolekks" and bentonite clay had a beneficial effect on animals. However, the greatest effect was obtained with simultaneous feeding of premix "Biolekks" and benonite clay.

Daily inspection of the animals showed that the safety of livestock was higher in the experimental groups where the additives were given to the pigs than in the control group. The survival of the animals in the 2nd and the 3rd experimental groups was 100 %, in the 1st experimental group – 98%, and in the control group - 96 %.

It is determined that 30-80% of unrelated (foreign) chemical agents are absorbedfrom the environment into the human's body via the food.

Except the live weight and safety the efficiency of growing pigs depends mostly on the carcass slaughter yield. Slaughter yield in the control group was identical to the 1st experimental group and equaled to 69.8%, as for the 2nd and 3rd experimental groups, the slaughter yield was higher than in the test one by 0.4% and 0.5 %.

The research results for heavy metals contained in the pork under the impact of premix "Biolekks" and bentonite clay are presented in Table 3.

The amount of lead, arsenic and cadmium in meat is within maximum concentration limits and do not have any difference. The level of mercury in the meat of the test group and

Table 3
Content of heavy metals in pork meat

Group	Lead, mg/kg	Arsenic, mg/kg	Cadmium, mg/kg	Mercury, mg/kg
Control	less 0.1	less 0.1	less 0.01	less 0.002
1st experimental	less 0.1	less 0.1	less 0.01	less 0.002
2nd experimental	less 0.1	less 0.1	less 0.01	less 0.00125
3rd experimental	less 0.1	less 0.1	less 0.01	less 0.00125

the 1st experimental group is 0.002 mg/kg, that is more than in the 2nd and the 3rd experimental groups by 37.5 %.

To assess the effectiveness of the influence of tested additives such as premix "Biolekks" and bentonite clay in feeding pigs calculations were made, the results of which are presented in Table 4.

The analysis of the data in table 4 indicates that the live weight of pigs at the end of the experiment was the highest in the 3rd experimental group and exceeded control result by 5.6 kg, the absolute live weight gains by 6.8 kg, slaughter yield by 0.5 %. In the experimental groups the additional costs for premix "Biolekks" were 150 roubles and for bentonite clay – 7.5 roubles. However, even considering these costs, the cost of 1 kg of live weight gain decreased in the 1st , 2nd and 3rd experimental groups by 4.99; 9.83; 11.25 rub. respectively, the profit increased by 331 rub; 551.5 rub; 726.5 rub., the level of profitability – by 7.7%; 16.0%; 18.6%

Additional products (meat) in the experimental groups allowed us to obtain cost recovery of 1 rub. spent for additives in the 1st experimental group in the amount of 3.21 rub, in the 2nd experimental group – 74.53 rub., in the 3rd one – 5.61 rub.

Discussion

The maximum realization of inherited potential productivity of farm animals by intensifying the metabolic processes gives additional opportunities to increase production yield without additional feed cost. Therefore, along with such factors as increasing surviving, improving the quality of feed and rations, optimization of the conditions for the animals, the new feeds' supplement gets widespread implementation (use) in feeding which control metabolism.

The effect of these supplements is caused by their regulating influence on the intensity of the digestion processes and utilization of feed nutrients that the management of these processes creates (Motovilov, 2014).

In our experiments carried out on pigs, it was found that live weight of pigs under the influence of bentonite clay increased by 2.9 %, the average daily gain in live weight – by 17.4%, slaughter yield by 0.4%, the level of profitability – by 23.8 %, the survival of livestock was 100%.

The similar results of feeding bentonite clay were obtained by N. A. Lopatina (2006), stating that the use of 3 % bentonite clay in pigs' diet contributed to the increase in carcass yield, the length of carcass, the area of m. *longisimus dorsi*, reduced the thickness of fat, increased the growth of animals.

Forests in Krasnoyarsk region occupy most of the territory. Annual harvest of pine timber leaves a huge amount of unused waste. These wastes might be used rationally, by using them in the production of feed additives, as they contain nutrients and biologically active substances: vitamins (A, E, K, b, C), and trace elements (copper, cobalt, iron, manganese, phosphorus). The research conducted on pigs, showed that giving the premix "Biolekks" had increased live weight by

Table 4
Economic parameters of growing pigs

Parameters	Group			
	Test	1st experimental	2nd experimental	3rd experimental
Live weight at the age of 125 days, kg	65.8	67.1	64.5	64.6
Live weight at the age of 175 days, kg	102.0	107.0	105.0	107.6
Absolute live weight gain, kg	36.2	39.9	40.5	43.0
Increase of live weight gain in experimental groups,	–	3.7	4.3	6.8
Slaughter yield, %	69.8	69.8	70.2	70.3
Selling price1 kg meat, RUB	130	130	130	130
The cost of live weight gain head/RUB	4706	5187	5265	5590
The costs per head/RUB.	3413.66	3563.66	3421.16	3571.16
The cost of the premix "Biolekks", 600 rubles/kg/day.	–	150	–	150
Cost of bentonite clay, 6000 RUB/t	–	–	7.5	7.5
The cost of 1 kg of gain in live weight, RUB.	94.30	89.31	84.47	83.05
Profit per 1 head, RUB	1292.34	1623.34	1843.84	2018.84
The level of profitability, %	37.9	45.6	53.9	56.5
The cost of additional products	–	481	559	884
Additional costs, RUB.	–	150	7.5	157.5
Cost recovery, RUB.	–	3.21	74.53	5.61

4.9 % (P < 0.999), surviving of pigs – by 2%, the level of profitability – by 7.8%. The enrichment of the diets of high yielding cows with premix "Biolekks" in the amount of 10 g per cow per day provided the increase in milk production, reduction of losses of live weight in the first 100 days of lactation, while improving hematological parameters, as well as economic indicators of milk production (Golubkov, 2014).

Conclusion

The tested feed additives such as premix "Biolekks" and bentonite clay had a positive impact on profitability of pork production. The greatest return (56.5 %) was obtained while feeding premix "Biolekks" in combination with bentonite clay. It is possible that this economic effect is caused by premix "Biolekks" and bentonite clay, which have a positive impact on the animal organism. The tested additives allowed to balance the diet with minerals, to improve the uptake of nutrients and biologically active substances of feed, to normalize metabolism and chemical composition of blood, to excrete heavy metals such as mercury, which helped to eventually achieve the growth rate of pigs.

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