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### ***PORK QUALITY INDICATORS WHEN FEEDING PROTEIN-VITAMIN-MINERAL ADDITIVE INTERMIX***

*When using local feed resources, i.e. grain of barley, wheat and corn, for pork production, it is rather difficult or even impossible to provide animals with necessary nutritional elements. Therefore, there is a need to enrich such low-ingredient diets with protein-vitamin-mineral additives (PVMA).*

*It is shown that feeding of Intermix PBMS in the amount of 10% of the weight of grain feed improves average daily gain of young pigs by 15.1%, under their level of 859 g, against 746 g in the control.*

*The slaughter weight and carcass weight have increased by 18.6 kg and 18.8 kg, while no adverse effects on the weight of internal organs has been revealed.*

*Application of Intermix PVMA in the diets of young animals at the rate of 10% of grain mixture mass has a high payback and provides additional profit of 3.28 UAH per invested hryvnia.*

**Keywords:** *young pigs, PVMA, feeding, productivity, slaughter indicators, pork quality*

**Tabl. 6. Ref. 6.**

**Formulation of the problem.** In modern economic and farming conditions pork production, especially in small farms and households, is carried out with the use of a limited amount of grain ingredients. Therefore, it is rather difficult to provide animals with the required nutritional elements, which are typically protein-vitamin-mineral additives (PVMA). When formulating their composition, the actual availability of nutrients in the basic diet is taken into account, and their deficiency is introduced in the composition of PVMA.

When feeding new PVMA, it is supposed to study both fattening and slaughter indicators with the assessment of product quality, which is associated with the economic efficiency and safety of the obtained feedstock when it is used for feeding purposes [6].

**Analysis of recent research and publications.** Some scientists argue that rational and balanced nutrition plays a key role in pig raising, which involves not only proper rationing and development of the efficient feed base, but also the use of modern, highly effective feeding systems. The study of the aspects of feeding pigs enables to increase significantly their productivity, in particular, fattening young pigs, thanks to science-based balancing of the diets by the energy content and amount of nutrients and biologically active substances [2].

Production of livestock products, in particular pork, can be increased due to the use of various feed additives that enrich the basic animal diet [3].

Therefore, it is important to improve the existing and develop new biologically active feed additives and stimulants of metabolic processes in the body of animals.

When using them in feeding, it is important to know not only their impact on the productivity, but also on the quality of the obtained products, metabolism, the state of internal organs and tissues, which normal growth and development of animals (reproduction) depends on in modern conditions of feeding [6].

**Methodology and methods of research.** The investigated premixes were manufactured in the production sector of the Ukrainian company LLC Interagrotech (Vinnytsia). This company produces premixes and PVMA for all technological groups of farm animal under «Intermix» brand [2].

The study of the performance of young pigs and production testing under feeding of a new PVMA «Intermix» were conducted in conditions of the breeding farm, which grows pigs of large white breed, of the state enterprise «Artemida», Kalynivka region, Vinnytsia oblast.

The research of feed samples was carried out in the Research Laboratory of the Department of Livestock Feeding and Water Bioresources of the Faculty of Technology of Production and Processing of Livestock Products at Vinnytsia National Agrarian University.

The main method of setting up zoo-technical experiments on animals for the study of the effectiveness of PVMA was the principle of similar groups [2]. To form them, the live weight of animals, age, sex, and origin were taken into account.

Scientific and economic experiment was carried out in two analogue groups of young pigs of large white breed with 12 pigs in each group according to the following scheme (Table 1). The initial live weight was 18.3 kg. The pigs were weaned from sows at a 45-day age, after which the livestock was formed for the comparative period.

Table 1

**Scheme of the scientific farming experiment**

Group	Number of animals	Characteristics of feeding by the periods and phases of feeding			
		comparative	basic		
		14-20 кг	20-35 кг	35-65 кг	65-110 кг
1 control	12	BD*	BD + PVMA Europrot pig 35-20%	BD + PVMA Europrot pig 65-15%	BD + PVMA Europrot pig 120-10%
2	12	BD	BD + PVMA «Intermix» WP-20% starter	BD + PVMA «Intermix» FP-15% grower	BD + PVMA «Intermix» FP-10% finisher

Note: \*BD – basic diet, WP – weaned pigs, FP – fattening pigs.

After a 15-day comparative period, the animals of the second group in the feeding phase of 20-35 kg were fed PVMA Intermix starter in the basic diet. In the feeding phase of 35-65 kg young pigs were fed PVMA Intermix grower, and in the feeding phase of 65 to 110 kg – Intermix finisher.

The control group of pigs was fed in the phases of growth the same amount of Intermix PVMA produced by a well-known company «Eurofeed modern feeding».

However the study of pork quality indicators involved the analysis of fattening and slaughter rates in the third, final phase of growing young pigs (live weight of 65-110 kg) and results of the control slaughter.

The basic research indicators were biometrically processed [2].

Rationing of feeding was carried out in energy feed units (EFU) in accordance with the new standards provided in the relevant guiding publications [1].

**The purpose of the research** is to study the performance and quality of pork when supplementing the diets of young pigs with a new PVMA «Intermix».

**Research results.** The studied PVMA «Intermix» was developed to supplement the diet consisting of two components, namely barley and wheat, under their different ratios at certain feeding phases. Deficiency of nutrients regarding the norm was compensated by BVMA [2].

The qualitative composition of the studied Intermix BVMA is given in Table 2.

Table 2

**Qualitative composition of the researched Intermix PVMA**

Indicator	Intermix PVMA		
	Intermix WP starter 20%	Intermix FP grower 15%	Intermix FP finisher 10%
1	2	3	4
Metabolizable energy Метаболічна енергія, MJ/KG	11.5	10.7	10.1
Crude protein, g	365	365	355
Crude fat, g	28	28.0	25.0
Rude fiber, g	35	50.0	53.0
Calcium, g	28.7	50.5	57.0
Sodium, g	11.0	12.5	14.6
Available phosphorus, g	10.0	10.0	5.5
Lizin, g	38.5	44.0	51
Methionine + Cystine, g	15.0	16.0	13
Treonin, g	21.0	21.0	20
Tryptophan, g	4.5	4.4	4.1
Iron, mg	680.0	650.0	645
Zinc, mg	680.0	550.0	550
Manganese, mg	350.0	315	315
Copper, mg	660.0	200	200
Iodine, mg	5.9	5.7	5.7
Selenium, mg	1.9	2.0	2
Cobalt, mg	1.3	3.0	3
Vitamines: A, thousand MO	76,000	72,000	72,000
D, thousand MO	8,000	11,000	11,000
E, mg	600	280	180
K <sub>3</sub>	11.5	10.8	10.8
B <sub>1</sub> , mg	14.5	13.0	13.0

Продовження таблиці 2

1	2	3	4
B <sub>2</sub> , mg	25.0	23.0	23.0
B <sub>6</sub> , mg	23.0	21.0	21.0
B <sub>12</sub> , mg	171.0	160.0	160.0
Biotin, Mcg	800	1,000	1,000
Vitamin C, mg	-	-	-
Niacin, mg	208	210	210
Calcium pantheteate, mg	70.0	65.0	65.0
Folic acid, mg	13.8	15.0	15.0
Choline chloride, mg	2.100	3,000	3,500
Enzymes	+	+	+
Intermix VC-complex	+	+	+
Antioxidants	+	+	+
Flavoring agent	+	+	+
Oxidizing substance	+	+	+

The positive qualities of the Intermix PVMA include the fact that they contain a complex of fodder enzymes (assist in the digestive process), provide reconstruction of intestinal villus and protect the digestive tract from the development of harmful bacteria (probiotic), promote better consumption of feeds (flavoring agent), improvement of the metabolism and strengthening of the immune system (vitamins), contain a high level of exogenous amino acids, the composition is adapted to pigs with high protein accumulation in the carcass, etc.

Application of Intermix PVMA at the final stage of growing young pigs for meat, during the feeding phase of 65-110 kg, contributed to a significant increase ( $P < 0.05$ ) in the animal productivity in the second group (Table 3). Hence, feeding of Intermix PVMA FP 10% in the diet caused an increase in average daily weight gain over 54 days of growing by 113 g or 15.1% more than in the control group. Reduction of feed consumption per 1 kg of gain was 0.64 EFU or 14% compared to the control.

Table 3

Performance of pigs with the live weight of 65-110 kg

Indicator	Groups	
	control	Intermix FP finisher, 10%
Live weight, kg:		
at the beginning of the period	62.3±1.1	64.1±1.3
at the end of the period	102.6±2.0	110.5±1.8
Duration of the period, days	54	54
Weight gain: absolute, kg	40.3±2.0	46.4±1.2*
average daily, g	746±37.0	859±22.0*
± before control, g	—	+113
± before control, %	—	15.1
Feed consumption per kg of weight gain, EFU	4.58	3.94
± before control, EFU	—	-0.64
± before control, %	—	-14.0

In two groups, the average daily weight gain was  $746 \pm 37$  g and  $859 \pm 22$  g, respectively.

The calculations showed that the animals of the experimental group reduced the costs per 1 kg of weight gain over 119 days of the basic period by 9.86%. Thus, animals of the second group, which were fed Intermix PVMA in the diet according to the experimental scheme, prevailed by the indicators of feed consumption.

Feeding of young pigs with Intermix PVMA, positively affected slaughter indicators of pigs (Table 4). Thus, pre-slaughter live weight of animals in the experimental group increased by 11.0%, slaughter weight by 14.0%, and carcass weight by 11.0% compared to the control,

As for these indicators, they were the highest in the pigs of the second group, which were fed Intermix PVMA 15% (finisher) in the feeding phase from 65 to 110 kg. Pre-slaughter weight increased by 7.9 kg, slaughter weight by 12.46 kg, carcass weight by 8.8 kg, and carcass output by 3.55%.

Table 4

Slaughter indicators of pigs,  $M \pm m$ ,  $n=3$

Indicator	Groups	
	1 control	2
Pre-slaughter live weight, kg	$102.6 \pm 1.1$	$110.5 \pm 1.1^{**}$
Slaughter weight, kg	$76.04 \pm 0.32$	$88.5 \pm 1^{***}$
Carcass weight, kg	$64.4 \pm 0.79$	$73.28 \pm 0.8^{**}$
Slaughter output, %	$62.79 \pm 0.32$	$66.31 \pm 0.47$
Head with ears, kg	$4.11 \pm 0.23$	$5.35 \pm 0.23^*$
Legs, kg	$1.32 \pm 0.07$	$1.62 \pm 0.16$
Skin and tail, kg	$5.56 \pm 0.64$	$7.33 \pm 0.08$
Internal fat, kg	$0.65 \pm 0.07$	$0.91 \pm 0.13$

In accordance with the increase in the pre-slaughter weight of animals in the experimental group, the weight of by-products was higher, in particular heads with ears 1.3 times, legs 1.2 times, skin with the tail 1.3 times, and internal fat 1.4 times. Feeding of young pigs with the studied Intermix PVMA has no probable effect on the change in the weight of the internal organs (Table 5). There is only a tendency towards its increase in the animals of the experimental group [2].

Table 5

Weight of internal organs of pigs,  $M \pm m$ ,  $n=3$

Indicator	Groups	
	1 control	2
Liver, kg	$1.47 \pm 0.11$	$1.60 \pm 0.03$
Heart, kg	$0.27 \pm 0.05$	$0.33 \pm 0.03$
Lungs, kg	$0.42 \pm 0.06$	$0.53 \pm 0.05$
Spleen, kg	$0.16 \pm 0.03$	$0.18 \pm 0.02$
Kidneys, kg	$0.26 \pm 0.04$	$0.33 \pm 0.04$
Pancreas, g	$81.3 \pm 5.1$	$103.3 \pm 22.9$
Adrenal glands, g	$4.13 \pm 0.23$	$5.80 \pm 0.09^*$
Thyroid gland, g	$40.56 \pm 4.6$	$48.4 \pm 1.36$

By the thyroid gland weight indices, there is no probable difference between the groups, except for the adrenal glands, the weight of which increased in animals of the second group compared to the control value.

Consumption of Intermix PVMA causes pork fat thickening (Table 6).

Table 6

Indicator	Pork fat thickness, cm, $M \pm m$ , $n=3$	
	Groups	
	1 control	2
On the neck	2.4±0.15	2.5±0.35
On the shoulder	3.0±0.08	3.3±0.23
On the back	1.3±0.07	1.6±0.26
On the sacrum	1.6±0.11	2.0±0.35
On the belly	1.9±0.15	2.1±0.15
Average	2.04±0.02	2.3±0.05

The more intensive fattening was observed in the pigs of the experimental group, especially on the sacrum – 25%, shoulder and neck – 10%. On average it increased 1.35 times.

In the second group, the pork fat thickness on the back and sacrum increased by 23-25%, on the shoulders and belly by 10%, and on the neck by 4%. The average thickness of the hypodermic pork fat was 12.7% higher than the control value of this indicator.

**Conclusions and prospects for further research.** Feeding young pigs with Intermix PVMA has high payback and provides the profit of 3.28 UAH per invested hryvnia.

Therefore, it is proposed to increase pork production in modern economic conditions, and to supplement low-ingredient cereal diets of young pigs grown for meat with Intermix protein-vitamin-mineral additive in the amount of 10% of the feed weight.

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### АНОТАЦІЯ

#### ПОКАЗНИКИ ЯКОСТІ СВИНИНИ ПРИ ЗГОДОВУВАННІ БІЛКОВО-ВІТАМІННО-МІНЕРАЛЬНОЇ ДОБАВКИ INTERMIX

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*Застосовуючи при виробництві свинини місцеві кормові ресурси, а це зерно ячменю, пшениці і кукурудзи, досить складно, а то й неможливо, забезпечити тварин необхідними елементами живлення. Тому виникає необхідність збагачувати такі малоінгредієнтні раціони білково-вітамінно-мінеральними добавками (БВМД).*

*Показано, що згодовування БВМД «Intermix» у кількості 10% від маси зернового корму покращує середньодобові прирости молодняку свиней на 15,1%, при їх рівні 859 г, проти 746 г – у контролі.*

*Збільшуються забійна маса і маса туші на 18,6 кг та 18,8 кг, при цьому не виявлено негативного впливу на масу внутрішніх органів.*

*Застосування БВМД «Intermix» в раціонах молодняку в дозі 10% від маси зерноsumіші має високу окупність, забезпечує отримання додатково, на вкладену гривню – 3,28 грн прибутку.*

*Ключові слова:* молодняк свиней, БВМД, згодовування, продуктивність, забійні показники, якість свинини

**Табл.6. Літ.6.**

**АННОТАЦІЯ**  
**ПОКАЗАТЕЛИ КАЧЕСТВА СВИНИНЫ ПРИ СКАРМЛИВАНИИ БЕЛКОВО-ВИТАМИННО-МИНЕРАЛЬНОЙ ДОБАВКИ ИНТЕРМИКС**

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Применяя при производстве свинины местные кормовые ресурсы, а это зерно ячменя, пшеницы и кукурузы, достаточно сложно, а то и невозможно обеспечить животных необходимыми элементами питания. Поэтому возникает необходимость обогащать такие малоингредиентные рационы белково-витаминно-минеральными добавками (БВМД).

Показано, что скормливание БВМД «Интермикс» в количестве 10% от массы зернового корма улучшает среднесуточные привесы молодняка свиней на 15,1%, при их уровне 859 г, против 746 г – в контроле.

Увеличиваются убойная масса и масса туши на 18,6 кг и 18,8 кг, при этом не выявлено отрицательного влияния на массу внутренних органов.

Применение БВМД «Интермикс» в рационах молодняка в дозе 10% от массы зерносмеси имеет высокую окупаемость, обеспечивает получение дополнительно на вложенную гривну – 3,28 грн прибыли.

**Ключевые слова:** молодняк свиней, БВМД, скормливание, производительность, убойные показатели, качество свинины

**Табл.6. Лит.6.**

**Інформація про авторів**

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