Hanfmehl ist im Vergleich zu Weizenmehl reich an Asche, Ballaststoffen, Eiweiß und Gesamtfasern.

Für die Bäckerei sind die IDK und die sinkende Zahl wichtige Indikatoren für die Qualität des Mehls. Nach diesen Indikatoren wird Hanfmehl als schwach charakterisiert, daher wird es beim Backen in einer Mischung mit Weizenmehl (in der Regel oder in einer Zusammensetzung) verwendet.

Die Untersuchung der Makro- und Mikroelementzusammensetzung von Hanfmehl wurde durch Massenspektrometrie mit Zerstäubung in induktiv gekoppeltem Plasma auf einem ICP-MS Perkin Elmer DRC II-Gerät, USA, durchgeführt.

Die Probenvorbereitung erfolgte nach dem Verfahren der Nassveraschung "Teflonbombe" in einem Mikrowellenofen unter Verwendung von Salpetersäure (Reagenzqualität) bzw. Wasserstoffperoxid (Reagenzqualität) in einem Verhältnis von 2:1.

Als Ergebnis von Untersuchungen wurde festgestellt, dass Hanfmehl Makro- und Mikroelemente enthält, die für den menschlichen Körper lebenswichtig sind.

Makronährstoffe wie Kalzium, Magnesium und Natrium sind in Hanfmehl in größeren Mengen enthalten als Weizen; So reichern wir Hanfmehl in Lebensmitteln an und bereichern Lebensmittel mit für den Menschen notwendigen Elementen. Hanfmehl enthält auch essentielle und bedingt essentielle Mikroelemente, die für den menschlichen Körper in Dosen erforderlich sind, die den Menschen nicht schädigen, was Hanfmehl zu einem vielversprechenden Produkt für den Lebensmittelmarkt der Russischen Föderation macht.

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EFFECTIVENESS OF VALINE AMINO ACID SUPPLEMENTATION IN PHASE RATIONS FOR BROILER CHICKENS

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***Abstract:** Ensuring the required level of complete protein and amino acids in the rations is necessary for good growth, health and high productivity of poultry. Knowing the levels of protein and amino acids in feed components and the need of broiler chickens for individual amino acids, it is possible to regulate protein nutrition targetedly at the level of individual amino acids and improve the amino acid profile of the ration. In broiler chicken feeding, valine is the fourth limiting amino acid after methionine, lysine and threonine. At the poultry farm of Yaroslavsky Broiler JSC, a study was conducted to assess the effect of adding synthetic valine to the main feeding ration on the zootechnical performance of broiler chickens and production profitability. In the control group, the diet included 3 limiting amino acids - lysine, methionine and threonine. In the experimental group, the diet included 4 limiting amino acids - lysine, methionine, threonine and valine, observing the valine balance. When chickens were raised on diets with valine (4 limiting amino acids supplemented), the average chicken live weight, feed conversion, total live weight and meat yield were better than in the control group receiving a diet without valine (3 limiting amino acids). Also, in the experimental group, less amount feed was expended, and the productivity index was higher than in the control group.*

***Key words:** Protein, limiting amino acids, valine, broiler chickens, productivity index.*

Introduction. Protein and amino acids are one of the most important components in feeding of farm animals and poultry. Providing complete protein in feed is necessary for the better growth, development and high productivity of poultry [1, 5]. Deficiency of crude protein or valuable amino acids in rations causes metabolic disorders in birds, a decrease in their productive qualities and growth rate. An excess of protein in the ration is not useful either, as it is not digested, can worsen the condition of the bird's intestines and intestinal microflora, and negatively affect the environment due to an increase in nitrogen excretion with droppings.

Modern feeding rations for broiler chickens are standardized not only for total crude protein content, but also for individual amino acids. Knowing the amino acid composition of feed and the requirements of birds for individual amino acids, it is possible to regulate their protein nutrition at the level of individual amino acids. Application of the concept of ideal protein, special computer programs and laboratory analyzes allows calculating and optimizing compound feed recipes for individual amino acids and reducing the excess protein in them. Thus, it is possible to improve the productivity and zootechnical indicators of the poultry, reduce the cost of feed and excess nitrogen emissions into the environment [2, 5].

To aid the deficiency of individual amino acids in the composition of the crude protein of feed, additives of synthetic amino acids such as lysine, methionine, threonine, tryptophan, and valine are used [4].

In broiler chicken feeding, valine is considered the fourth limiting amino acid after

methionine, lysine and threonine. Modern synthetic additives of valine are characterized by a high availability of amino acid - not less than 98%. They are used in the practice of poultry factories and farms to reduce the content of excess crude protein in the diet and improve balance of individual amino acids in rations. At the poultry farm Yaroslavsky Broiler JSC, a study was conducted to assess the effect of adding synthetic amino acid valine to the main ration on the zootechnical performance of broiler chickens and production profitability.

Materials and methods. A survey was carried out at the poultry farm Yaroslavsky Broiler JSC, with broiler chickens of the Ross 308 cross from 1-day post-hatch to slaughter. During the entire growing period, the birds received rations developed according to the fodder program of Yaroslavsky Broiler JSC. The recommendations of VNITIP, NRC 1994 and Aviagen for broiler chickens of the Ross 308 cross were also considered in the ration formulation, with the obligatory optimization of rations [2, 3].

A phase feeding scheme of 5 phases was used. Chickens received a ration in a form of a full-feed factory compound feed of the appropriate recipe, depending on age. For the Pre-starter (1-7 days) and Starter (8-14 days) phases feed was crumbled; for the phases Grower (15-28 days), Finisher-1 (29-36 days) and Finisher-2 (37-42 days) feed was granulated.

The recipes were based on whole wheat (50-59%) and soybean meal (12-27%) with the addition of corn (5-12%). The composition of the ration formulations of the feeding programme includes a total of 24-26 components, including amino acids, mineral additives, premix, enzymes, coccidiostatic and probiotic.

The conditions of keeping (arrangement of poultry houses, drinking patterns, microclimate, temperature, ventilation, bedding, equipment) were same for both groups. The experiment was carried out in 2 poultry houses, 3 halls in each, the average stocking density was 23.75 birds / m^2. There were 82086 chickens in each house, 27362 in the hall. The average weight of day-old chicks at check-in was 44 g (45.75 g - experiment and 42.25 g - control). All poultry houses are floor keeping, equipped with modern systems of watering, feeding and microclimate control. The equipment is standard and is in use for several years.

The rations were normalized for the main indicators (ME, crude protein, crude fat, crude fiber), mineral elements (Ca, P, K, Na, Cl, NaCl), vitamins and individual amino acids (lysine, methionine, threonine, and valine). For each standardized component, total and digestible values have been determined. Optimization of rations was carried out using the "Korm Optima" software package.

In the control group, all rations included 3 limiting amino acids - lysine, methionine and threonine. The feeding rations of the experimental group included 4 limiting amino acids - lysine, methionine, threonine and valine, in compliance with the valine balance. This is the first time this recipe has been used at the enterprise.

For a source of synthetic valine, a certified feed additive of L-valine manufactured by CJ (China) was used in an amount of 0.10-0.04%. Valine additive is a product of microbiological synthesis and is a dried crystalline extract of fermentation products of Corynebacterium glutamicum ATTC13032, containing at least 98% of the active ingredient L-valine and is used for the production of premixes, feed additives and compound feeds for farm animals, including birds and fish. The experiment scheme is presented in Table 1.

Table 1

Survey scheme

Ration dedepnding on age of broiler-chickens	Контроль	Опыт
Pre-starter (1-7 days)	MR*	MR supplemented with 0,10% synthetic valine
Starter (8-14 days)	MR	MR supplemented with 0,07% synthetic valine
Grower (15-28 days)	MR	MR supplemented with 0,05% synthetic valine
Finisher-1 (29-36 days)	MR	MR supplemented with 0,04% synthetic valine
Finisher-2 (37-42 days)	MR	MR supplemented with 0,04% synthetic valine

**MR– the basic ration in the form of a complete factory feed, balanced in basic nutrients, depending on the age of broiler chickens*

Enrichment of pilot batches of compound feeds with synthetic valine was carried out at JSC RKKZ.

Results and discussion. The crude protein level in the experimental diets in both the control and valine groups was by 0.5-1.5% lower than the standard specifications for the Ross 308 cross (Table 2) [3]. Crude protein levels below the standard level were chosen to assess the possibility of reducing excess nitrogen in the diet without losing quality and yield and livestock zootechnical indicators, as well as to improve the ecology of production. The metabolic energy levels of the feed were also slightly lower than the specifications (Table 2).

The reduced level of total crude protein and amino acids in the compound feed recipes was compensated by the addition of 3 limiting amino acids in the control group (lysine, methionine, threonine) and 4 in the experimental group (lysine, methionine, threonine and valine).

Table 2

Levels of metabolic energy, protein and 4 limiting amino acids in broiler diets: A) control group, B) experimental group (+ valine)

Parameter	Ration									
	A) Control group (no valine added)									
	Pre-starter		Starter		Grower		Finisher 1		Finisher 2	
Age, days	0-7		8-14		15-28		29-36		37-42	
ME, kkal/kg	2970		3000		3050		3100		3100	
Amino acids, %:	Tot[1].	Dig[1].	Tot	Dig.	Tot	Dig.	Tot	Dig.	Tot	Dig.
Lysine	1,4	1,28	1,31	1,20	1,24	1,13	1,15	1,05	1,10	1,00
Methionine+cystine	1,06	1,08	1,04	0,95	0,97	0,88	0,90	0,82	0,85	0,77
Methionine	0,69	0,65	0,69	0,65	0,63	0,59	0,57	0,54	0,53	0,50
Threonine	1,00	0,88	0,92	0,81	0,89	0,78	0,82	0,71	0,78	0,68
Valine*	0,99	0,88	0,95	0,84	0,91	0,81	0,87	0,77	0,82	0,73
Crude protein, %	22,5		21,5		20,5		19,5		18,5	
EPR	132		140		149		159		168	
	Б) Experimental group (+valine)									
	Pre-starter		Starter		Grower		Finisher 1		Finisher 2	

Table 2, cont.

Age, days	0-7		8-14		15-28		29-36		37-42	
ME, kkal/kg	2970		3000		3050		3100		3100	
Amino acids, %:	Tot[1].	Dig[1].	Tot	Dig.	Tot	Dig.	Tot	Dig.	Tot	Dig.
Lysine	1,39	1,28	1,32	1,21	1,23	1,12	1,16	1,05	1,09	1,00
Methionine+cystine	1,06	0,97	1,00	0,91	0,96	0,87	0,90	0,82	0,85	0,77
Methionine	0,69	0,65	0,65	0,62	0,62	0,59	0,57	0,54	0,53	0,50
Threonine	1,00	0,88	0,93	0,81	0,87	0,76	0,81	0,71	0,78	0,68
Valine*	1,07	0,96	1,02	0,91	0,95	0,85	0,91	0,81	0,85	0,76
Crude protein, %	22,4		21,4		20,3		19,5		18,3	
EPR	133		140		150		159		169	

*1 Tot. = total, Dig.= digestible . * According to the specifications for Ross 308 broilers (final weight 2.5-3.0 kg), the recommended values of valine Tot./Dig. are: Starter 1.10 / 0.96, Grower 1.0 / 0.87, Finisher-1 0.89 / 0.78, Finisher-2 0.84 / 0.73*

The levels of individual amino acids in compound feeds were normalized. For the control group rations and for the experimental group with supplied valine, the content of the first three limiting amino acids (lysine, methionine, threonine) was brought to the levels as specified for the Ross 308, despite the lower content of crude protein in the diet. Digestible valine levels in rations of the experimental group were in mass percentage (%): Pre-starter 0.96; Starter 0.91, Grower 0.85; Finisher-1 0.81; Finisher-2 0.86, which is higher than in the control group and only slightly below the specified values for Ross 308 (Table 2).

The valine: lysine ratio in rations was 0.71-0.81, which is within the recommended optimal range [4].

The energy-protein ratio (EPR) levels for the control and treatment groups were 132-169, with an increase from the Pre-starter ration to the Finisher-2, as chickens need less crude protein and more energy starting from Grower period onward.

The results for the zootechnical parameters of the broiler chickens are presented in Table 3. The average values for 3 halls for the experimental and control group of chickens are given, for the indicators with (*) – the total values for 3 halls.

Table 3

The resulting zootechnical parameters of broiler chickens in the experimental and control groups

Parameter	Control group	Experimental group
Number of chickens at start	82086	82086
Average daily weight gain, g	61,68	62,12
Average live weigt, kg	2,71	2,74
Livability, %	96,77	96,81
Number of chickens at slaughter*	79469	79475
Total meat yield*, kg	205306	207449
Total feed used*, kg	335316	334220
Meat yield from $1m^2$, kg	59,41	60,03
Feed conversion ratio (FCR)	1,63	1,61
Productivity index (EIP)	383,1	392,3

** Sum total in 3 halls, others – average for 3 halls*

Average daily weight gain in the control group was 61.68 g, and in the experimental group raised on rations with added valine – 62.12 g, which is 0.71% higher than in the control

group. The livability of broilers in both groups was over 96%.

The average final live weight of chickens in the control group was 2.71 kg, while in the experimental group fed rations with valine - 2.74 kg, which is 1.1% more than in the control group.

A total of 205306 kg of meat was obtained from chickens in the control group, and from chickens in the experimental group – 207449 kg of meat, making the meat yield in the experimental group 2143 kg bigger than in the control. The meat yield from 1 m^2 was 59.41 kg and 60.03 kg for the control and experimental groups, respectively. Thus, at the same stocking density, the meat yield from 1 m^2 from the chickens in the experimental group was 600 g bigger than from the chickens in the control group.

Amount of feed expended and feed cost were also measured. For the raising of the control group of chickens, 335316 kg of feed were expended, while for the raising of the chickens of the experimental group it was 334220 kg of feed, which is 1096 kg less, while the cost of 1 tonn of feed was by 0.025% lower.

Good feed conversion rates (FCR) were achieved: 1.63 for the control group and 1.61 for the experimental group.

Based on the data of livability, average live weight and FCR, the European productivity index (EIP) was calculated for the experimental and control groups of chickens using the following formula:

$$\mathrm{EIP} = \frac{\text{Livability (\%)} \cdot \text{Avg. live weight (kg)}}{\text{Age (days)} \quad \text{FCR}} \cdot 100$$

In the control group, the productivity index was 383.1, and in the experimental group – 392.3, which is 9.2 points higher than in the control.

Conclusions. Phase rations supplemented with synthetic valine and reduced crude protein levels have been used in a poultry farm of Yaroslavky Broler JSC first time.

The lower level of crude protein in the rations was compensated by the inclusion of additives of first limiting amino acids – lysine, methionine, threonine, and in the experimental group additionally – valine.

It was shown that the addition of valine to the rations in the amount of 0.04-0.10% does not reduce their nutritional value. Along with the first 3 limiting amino acids, crystalline valine supplementation improved the amino acid profile of the rations. Digestible valine levels in the experimental group were higher than in the control group and only slightly below the recommended values for Ross 308 broiler chickens.

When valine was added to compound feed recipes, that is, when 4 limiting amino acids were supplied, average daily weight gain, average chicken live weight, feed conversion and total meat yield were better than in the control group, where rations contained 3 limiting amino acids additives and no added valine. Also, in the experimental group, the total amount of feed expended was less, while the productivity index was higher than in the control group.

A survey carried out at a poultry farm Yaroslavsky Broiler JSC using a phase feeding program for broiler chickens of a balanced complete feed rations based on wheat, soybean meal and corn and comparing the addition of the first 3 limiting amino acids in control group and 4 limiting amino acids (+valine) in the experimental group has shown that using a feeding programme with valine it is possible to obtain good performance results and ensure profitability

of production , as evidenced by the obtained zootechnical indicators of broilers, the amounts of feed expended and the values of the productivity index.

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NETWORK INTERACTION ROLE IN PREPARING STUDENTS FOR INDEPENDENT DIAGNOSTICS IN THE DEMO EXAM FORMAT BASED ON STANDARDS FOR WORLDSKILLS RUSSIA

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Abstract: *The article discusses the possibilities of organizing and preparing students for Worldskills competitions to improve professional training quality and broaden contacts with social partners.*

Key words*: secondary vocational education system, WorldSkills movement, in-plant training.*

On the one hand, contemporary labor market is sure to require a competent specialist with a strong educational foundation and professional training, that is a person, who can independently acquire and apply knowledge in practice, solve any professional problems. But on the other hand, employees with a high level of professional values development are high demand. Any future specialist should understand values and significance of his profession, fill collar, realize that he is responsible for the implementation of his professional activities, etc.

At present the most important task of the vocational education system is supposed to be improvement of training quality of students and teaching staff in accordance with the modern level of production development and employers' expectations. Enterprises need specialists who are ready to be included in further professional activities immediately after graduation, capable