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Rationale of arginine and lysine ratio in the diets of repair chickens

We got experimental data and saw an increase of live weight and egg production. The cost of feed too decreased under the influence of different level of arginine and lysine in diets. The effect of different ratio of arginine and lysine on the productivity of repair chickens are investigated.

Protein, amino acids, arginine, lysine

Egg productive largely depends on growing quality and feeding adjusted of depending on age and live weight [1, 3, 5]. The chicks eats starter mixed fodder in the first 4 days. This feed had greatest amount of easily digestible nutrients. Feed that intended for poultry of start-period (5–30 days) can be given to chickens from the first day of life. But in additionally, you can add 4–6% of skimmed milk powder or whole milk substitute.

But to fully realize the genotype of birds is possible only if the feeding is balanced for all nutrients and biologically active substances in accordance to the needs. It is desirable to take into account the levels of 11 essential amino acids: methionine, lysine, tryptophan, arginine, valine, histidine, leucine, isoleucine, treanine, phenylalanine and glycine [4, 6] and their relationship.

Material and methods of research. The research was conducted in LLC "Kozhuchivska" (Kiev's region) on layers "Brown nick". The trial was conducted by method of groups (tab. 1).

We selected 400 chicks of day-old age according to the scheme. It was formed four groups on the basis of analogues (control and 3 experimental). In each group were 100 heads. The main period lasted 19 weeks.

The chickens were fed by mash compound feed balanced by existing norms in the accounting period [7, 9]. We fed with different levels of amino acids according to the research groups. The

1. Scheme of scientific and economic trial

Age, weeks	Indicators	Group			
		1	2	3	4
1-3	Arginine, %	1.20	1.1	1.20	1.3
	Lysine, %	1.20	1.1	1.20	1.3
	the ratio	1.0	1.0	1.0	1.0
4-8	Arginine, %	1.10	1.0	1.20	1.30
	Lysine, %	1.10	1.0	1.10	1.10
	the ratio	1.0	1.0	1.1	1.2
9-16	Arginine, %	0.77	0.75	0.79	0.81
	Lysine, %	0.70	0.75	0.66	0.63
	the ratio	1.1	1.0	1.2	1.3
17-19	Arginine, %	0.88	0.86	0.90	0.92
	Lysine, %	0.80	0.86	0.75	0.71
	the ratio	1.1	1.0	1.2	1.3

amino acid content of feed was balanced by adding synthetic acids.

Chicks were weighed (accuracy $\pm 5g$) the beginning, middle and at the end of the experience.

The safety of chickens was determined every day. The mass of feed consumed by the group was determined daily for each of the period and for the entire period of experiment.

Own research. The content of metabolize energy, nutrients and biologically active substances in the feed of the experimental chicks were changed in accordance with the phases of their use (table 2).

2. Composition of feed for repair chickens, %

Component	Age, weeks			
	0–3	4–8	9–17	17–19
Wheat	31.0	29.0	35.0	30.0
Corn	40.0	40.5	40.0	40.0
Soybean meal	21.0	20.4	15.2	20.0
Sunflower meal		6.0	6.0	6.0
Fish meal	6.0	—	—	—
Sunflower oil	0.2	0,3	0.3	0.3
Salt	0.1	0,3	0.3	0.3
Dicalcium phosphate	1.0	2,1	2.0	2.1
Limestone	0.6	0,6	0.6	0.5
Premix	0.1	0.8	0.6	0.8
In all	100.0	100.0	100.0	100.0

Feed should contain a relatively high amount of protein and energy for the growth of chickens. But the crucial period in their feeding begins by the 60-day age. In this period the reduction of protein can prevent of premature ripening of chickens, to ensure normal growth and prepare the bird for productive period.

We determined nutritive content of feed based on lab analyses (laboratory of feed additives, department of feeding and feed technologies named Pshenichny. (tab.3).

3. The content of basic nutrients and energy in 100 g of feed, %

Indicators	Age, weeks			
	1-3	4-8	9-17	17 - 19
Metabolizable energy, MJ	1,20	1,14	1,14	1,14
Crude protein, g	20.0	18.5	14.5	17.5
Crude fiber, g	5.0	5.0	7.0	5.5
Calcium, g	1.05	1.00	0.90	2.00
Phosphorus, g	0.75	0.70	0.58	0.65
Linoleic acid, g	2.00	1.40	1.00	1.00
Sodium, g	0.18	0.17	0.16	0.16
Chlorine, g	0.20	0.19	0.16	0.16

The concentration of metabolic energy, nutrient and biologically active substances in 100 g of feed was consistent with the norms established for the repair chickens in different production periods. The table 4 shows the content of essential amino acids in feed for chickens of the control group.

Amount of essential amino acids in feed for chickens of the control group was at the level recommended by the H&N International (developer of the cross) [9].

4. The content of essential amino acids in feed, %

Amino acids	Age, weeks			
	1–3	4–8	9–17	17–19
Arginine	1.20	1.00	0.65	0.85
Valine	0.89	0.75	0.53	0.70
Glycine	1.00	0.80	0.70	0.79
Isoleucine	0.70	0.65	0.49	0.56
Leucine	1.40	1.20	0.98	1.12
Lysine	1.20	1.00	0.65	0.85
Methionine	0.48	0.40	0.34	0.36
Cystine	0.35	0.30	0.26	0.32
Tryptophan	0.23	0.21	0.16	0.20
Threonine	0.80	0.70	0.50	0.60
Phenylalanine	0.63	0.60	0.44	0.50

5. The productivity of chickens and feed costs

Indicators	Group			
	1	2	3	4
Live weight during the trial g:				
– in the beginning	71 \pm 1,12	69 \pm 1,23	69 \pm 0,86	70 \pm 0,97
– in the end	1460 \pm 8.12	1471 \pm 7.21	1512 \pm 4,79	1485 \pm 5.18
Average daily gain, g	11.0 \pm 0.12	11.1 \pm 0.11**	11.5 \pm 0.17***	11.2 \pm 0.14*
The cost of feed, g:				
– for the entire period	6 450 \pm 22	6 453 \pm 17	6 441 \pm 11	6 462 \pm 12
– per 1 kg	4 417 \pm 11	4 387 \pm 14	4 259 \pm 16	4 352 \pm 22
* – $P < 0.05$; ** – $P < 0.01$; *** – $P < 0.001$ compared to control				

The live weight and feed conversion are main performance indicators (tab. 5).

As can be seen from the data in table 5, the highest live weight was on the chick from the third group, where the ratio of arginine to lysine was 1.05; 1.05; 1.05 and 1.06, respectively.

The relationship of arginine to lysine ratio in the diets of chickens with its live weight at different periods of cultivation more accurately describes the mathematical model with non-linear characteristic (polynomial trendline), which has a higher value of reliability of the approximation (R^2) than the linear relationship (table.6).

6. The growth of repair chickens (y) depending on the ratio of arginine and lysine (x) in the diets

Age, weeks	Regression (R)	Approximation (R^2)
4–8	$y = -141.25x^2 + 316.7x - 176.25$	0.9629
9–16	$y = -32.408x^2 + 80.081x - 48.829$	0.6522
17–19	$y = -34.507x^2 + 84.452x - 51.054$	0.5901

It should be noted that in our studies set the trend: the influence of the ratio of arginine to lysine on the productivity of repair chickens decreases with age (level of approximation R^2 decreases from 0.9629 at the beginning of cultivation to 0.5901 at the end of cultivation).

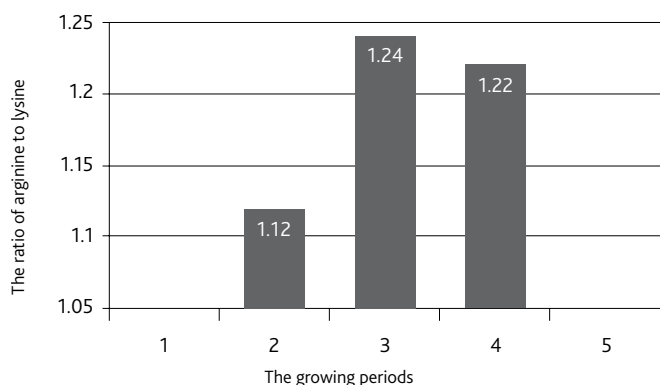


Fig.1. The effective ratio of arginine to lysine

The derivative of the above regression equations allowed us to establish that for these periods the effective ratio of arginine to lysine in the diets of young chicks are different and rises to 16 weeks of age (Fig. 1).

For optimal relationship of arginine to lysine (1.12 during physiological trial), the efficient use of arginine amounted to 95.8%, lysine – 96.1%.

It should be noted that in repair chickens rearing when the optimum ratio of arginine and lysine in the diet, these two amino acids exhibit synergistic properties, it thereby increasing its live weight and the absorption of these amino acids in the digestive tract.

Conclusions

1. Amino acid levels in feed for poultry is main indicator of its usefulness of protein, and the ratio of individual amino acids can be a crucial condition for their metabolism.

2. The feeding of repair birds with lysine 1.21; 1.11; of 0.71 and 0.81% respectively to different periods of its growth to contributes the increase of live weight at the end of growing by 15.2% and to reducing the use of feed for 1 kg of growth by 17.7%.

3. The ratio of arginine to lysine as 1:1 throughout the growing period of rearing to contribute to a sustainable increase of its body weight, however, negatively affects the economic efficiency of production, because usually the level of arginine in the ingredients for feed production total above the level of lysine, the amount of which would need to be increased due to the synthetic preparations of this amino acid, which are rather pricy.

4. The proposed of mathematical model reflecting the relationship between the need for individual essential amino acids and the age of repair chicks, allow systematically, throughout the period of growth and effectively to supervise nutrition of amino acid. ■

Отримано експериментальні дані щодо прогнозованого збільшення живої маси ремонтних курчат яєчного напрямку продуктивності за менших витрат кормів під впливом різного рівня аргініну і лізину у їх раціонах. Досліджено вплив різних співвідношень аргініну і лізину на продуктивність ремонтного молодняку.

Протеїн, амінокислоти, аргінін, лізин

Получены экспериментальные данные по прогнозированию увеличения живой массы ремонтного молодняка птицы яичного направления продуктивности при меньших затратах кормов под воздействием разного уровня аргинина и лизина в рационах. Исследовано влияние разных соотношений аргинина и лизина на продуктивность ремонтного молодняка.

Протеин, аминокислоты, аргинин, лизин

References

- Архипов А.В. Протеиновое и аминокислотное питание птицы // А.В. Архипов, Л.В. Топорова – М.: Колос, 1984, – 174с.
- Ібатуллін І.І. Практикум з основ наукових досліджень у тваринництві // Ібатуллін І.І. Кононенко В.К., Патров В.С. – К., Аграрна освіта, 2004. – с. 133
- Ібатуллін І.І. Продуктивність перепелів / І.І. Ібатуллін, І.І.Ільчук, В.М. Кондратюк // Сучасне птахівництво. – 2005. – №11 (36).
- Ібатуллін І.І. Лізин і аргінін: рівень і співвідношення у раціонах курей батьківського стада / І.І. Ібатуллін, М.Я. Кривенюк, І.І.Ільчук // Науковий вісник НААН України, – 2014, – № 1.
- Подобед Л.И. Протеиновое и аминокислотное питание сельскохозяйственной птицы: структура, источники, оптимизация / Издание второе, дополненное и переработанное // Подобед Л.И. – Днепропетровск, 2010, – 240с.
- Раецкая Н. В. Использование синтетических аминокислот в кормлении птицы// Раецкая Н. В.– В.: ВНИИТЕИСХ, 1991. – 40с.
- Рекомендації з нормування годівлі сільськогосподарської птиці/ Братишко Н.І., Горобець А.І., Притуленко О.В. та ін.; за редакцією Ю.О. Рябоконя. – Бірки, 2005. – 101с.
- Римбак М. Усвояемые аминокислоты – строительный материал для поддержки и продуктивности // Римбак М., Хаммер Й. Успех в хлеву. – 2008. – №1. – С. 16.
- Руководство по содержанию финального гибрида Браун Ник. – К.: ПОА Кожуховское. – 2013. – 56 с.
- Ensminger M.E. Feed and nutrition/ M.E. Ensminger, I.E. Oldfield, W.W. Heinemann – Glovisc: The Ensminger Publication Company. – 1990. – 1544 p.
- Jeroch H. Ernährung landwirtschaftlicher Nutztiere // Jeroch H., Drochner W., Simon O. – Stuttgart: Ulmer, 1999. – 544s.